LIBRARY OF CONGRESS
JUN 8
SMITHSONIAN DEPOSIT

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LIV.—No. 23. Whole No. 835. | NEW YORK, MONDAY, JUNE 8, 1891. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C.O.D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

The Blundering at St. Louis..... 809

Report of the World's Fair Committee, Western Association..... 810

The Market for Gas Securities..... 810

A Movement to Establish a Plan of Standard Castings..... 810

Fourteenth Annual Meeting of the Western Gas Association—Official Report—Revised by the Secretary—Continued from Page 781..... 811

Gas Engines: Some Practical Results and Comparisons, by Mr E. H. Jenkins—Discussion—Report of Finance Committee—Report of Secretary and Treasurer—Second Day: Morning Session—Roll Call—Election of New Members—Report of Committee on President's Address—Report of Committee on World's Fair.

*The Atkinson Cycle Gas Engine..... 818

Hydraulic Cements..... 818

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 820

The Changes at St. Louis—Public Lighting, Fort Wayne, Ind.—Death of Mrs. Leach—Another of the Berlin Iron Bridge Company's Orders—Fixing the Brooklyn Gas Rate—Death of E. M. Russell—The Maryland Meter Manufacturing Company—Annual Meeting, Kansas City, Mo.—Hogan Withdraws the Suit—Improvements at Danville, Ills.—Opposition at Plainfield, N. J.—Public Lighting, Baltimore, Md.—The Situation as it Appears to Mr. Andrews—And Other Items.

THE BLUNDERING AT ST. LOUIS.

The brief announcement in last week's JOURNAL to the effect that Mr. Frederic Egner, Engineer-in-Chief to the Laclede Gas Light Company, of St. Louis, had been requested to resign his position, has aroused widespread interest; for the whole affair has been such a mystery that one cannot help speculating upon it. The brutal bluntness of the first information is not so bad now, in that the gentlemen who effected this remarkable *coup de theatre* permitted the central figure in the tragedy to hold his place on the boards for 30 days more than was their original intention. In other words, Mr. Egner is permitted to remain in charge until June 30th, instead of "ceasing" his connection with the Company on May 31st, last, or the day after that selected by the nation to commemorate the valor of those who served their country on her battlefields. Without going further in the matter at once, we (speaking in the strictest personal sense) are rather sorry that Mr. Egner accepted the respite, and would have been far better pleased had he refused to remain a day beyond that originally fixed by the King Bomba who issued the edict.

The more one looks into this matter the less explicable it appears. On the one hand we have an engineer whose record in his particular place is irreproachable, so far as the technique of his profession is concerned; and it is with that alone we have to deal, since Mr. Egner, along with his demit, received the most profound assurances of the belief of his employers that as an engineer he was especially fitted for the post from which he was being ousted. Queer reasoning, this, on the part of King Bomba. "My subject," we may take him as saying, "is loyal and valiant, but I will try another, who may be equally loyal, but less valiant;" for it must be borne in mind that Bomba preferred live hostages to either dying or dead warriors. Yet, whatever may have been the cause that led to Mr. Egner's retirement, one plain, obtrusive fact remains, and that is that the executive management of the Laclede Company has managed to put itself before the American gas world as a laughing stock. From the very inception of the consolidation scheme, its finances have been bungled. Those who engineered its details presumed that their first securities would be floated by the winds, and they are being so floated, but not at a very great height from obstacles the nature of which is very well known by the youth who attempts to fly his kite in safety over a neighboring bit of woodland without first having regard to the number of yards of twine that he has at his immediate command.

Mr. Egner's engineering capacity having been admitted, and his success in managing the Company's works having gone on record, we must of necessity accept King Bomba's decree that the resignation is asked for because expenses are to be reduced. But we beg leave to submit that he would be an odd physician who suggested that, because of the poverty of his patient, the latter would stand a better chance of recovery were the necessary medicine omitted. It is true, the doctor must look out for himself; but of what use is his talent to the patient, if the medicines that he prescribes are not forthcoming—provided there be virtue in drugs. If the expenses are high at St. Louis, and a saving must be made, why not cause the Engineer and the President to take on the dual office. Most any level headed man can assume the presidential duties at a gas works, but it requires skill and training to succeed in the engineer's position; and thus the moral becomes plain. Mr. Egner might have made

a good president, and since we know that he was an excellent engineer why not have promoted him instead of dismissing him. Nor is this talking at random, for we have three shining examples of this sort of progression extant in America to-day—Mr. McIlhenny, at Washington, D. C., Mr. Vanderpool, of Newark, N. J., and Mr. Crockett, of San Francisco, Cal. On the other hand, we fail to note where the "progression" was in line from the presidency to an engineership—that is, any notable instance.

We know that many hold the belief that Mr. Egner's address to the Western Association at Louisville, on account of some of the utterances therein, is the cause of the severance of his relations with the Laclede Company, and while that would have been sufficiently "small politics" to have earned for King Bomba the contempt of every gas engineer in America, it may turn out in the end that even "smaller politics" than that was the spur that caused the wincing. The truth is sure to come out in the long run, and in the meantime Mr. Egner must bear the brunt. This, however, he can do without discomfort, in that his course at St. Louis was that of an efficient, loyal and hardworking employee.

REPORT OF THE WORLD'S FAIR COMMITTEE, WESTERN ASSOCIATION.

To say the least, the report submitted to the Western Association by its Committee on the World's Fair, is discouraging. Even a cursory examination of its lines will show that there has not been much concert of action by the members. In fact the reverse is pointedly the case, as is shown in the remarks made by Mr. Boardman in opposition to the main recommendation of the report; and Mr. Boardman is a member of the Committee. To begin with, however, the Committee has lacked cohesiveness through unforeseen circumstances. Its Chairman (Mr. Geo. G. Ramsdell), whose aptness for committee work has been demonstrated in our Associations many times, was unable to take the matter in hand, because of important changes in his business relations, that absolutely necessitated his entire attention to put them in train—in fact, owing to this very cause he could not attend the Louisville convention, and that is saying enough in proof that duty and desire were at odds with him this year. Mr. Forstall, also, and Mr. Boardman, as well, were deterred from their whole duty to the Committee by similar causes, and so the work all fell to Mr. Walton Clark and Secretary Littleton—who are located 1,000 miles apart.

Remembering all this it is creditable that Mr. Clark should take the burden upon himself and come out boldly on the question.

To come to the report itself (which will be found on p. 815), we fail to see why gas men should concern themselves greatly over the presumed decision arrived at by those in control of the lighting of the exhibition buildings to use electric light only. If the electricians are willing to go on advertising themselves at their own expense, we think they should be permitted to have full fling. That which is new must have its novelty prominently brought out, just as that which has been tried and found not wanting can hold its own against all comers without undue display of fuss and feathers. To our view it would seem that those most prominently concerned in the lighting of the permanent buildings are the Chicago Gas Companies, and as the proprietors of these do not seem to be greatly disturbed, and as they have not asked for outside aid, perhaps it would be well to wait and hear from them ere the Companies in other cities are asked to sit in the anxious seat. The city of Chicago can show 100 gas jets for each incandescent electric lamp that burns within her precincts—all in active work and all being paid for; thus, with that disparity, does it seem that the visitor to the Exhibition will not fail to notice it? If we are assured that the makers of gas apparatus of all grades and varieties are to be represented on the floors of the buildings by displays, complete and well attended, we confess to a sense of perfect safety over the ultimate result. However, we presume the joint committee of the Associations are at work, and what they determinine upon will be well thought out.

The Market for Gas Securities.

The Consolidated Company has declared its regular semi-annual dividend of 2½ per cent., payable on and after the 15th inst., at the Irving Place office. To day (Friday) the shares are quoted at 96, ex div. During the week the market for city shares was absolutely lifeless, and there is no doubt about the fact that many well-informed holders were disappointed at the dividend. Brooklyn shares are weaker because of the agreement reached to accept, for the present, the $1.25 State rate. Chicago gas is strong, and Laclede common is offered at less than 16. Eastern shares, particularly Brookline (Mass.) and New Haven (Conn.) are very strong.

[Preliminary Report to the Society of Gas Lighting.]

A Movement to Establish a Plan of Standard Castings.

The Committee appointed at the November (1890) meeting of the Society to look into the matter of uniformity in special castings used by gas works, beg leave to report the results of their investigations, as follows:

We thought it prudent to at first confine our efforts to the establishing of a standard for those castings which are used at the gas works proper; the same standard may afterward be extended to the specials used in the street department.

To start the thing we addressed a circular letter* to the principal manufacturers of gas works apparatus, setting forth the object in view and asking for their co-operation. To this letter we received replies from Messrs. R. D. Wood & Co., the Isbell Porter Co., James R. Floyd & Sons, the Continental Iron Works, Bartlett, Hayward & Co., Morris, Tasker & Co., and the Davis & Farnum Mfg. Co., which replies were, in the main, favorable.

Subsequently, we also received from five of the above-named firms schedules and sketches showing the patterns and dimensions generally used by them in connection with their work. These dimensions given by the various firms are tabulated on Exhibit III. From this table it will appear at a glance what difference exists in the patterns and templates in use at the different foundries furnishing this information.

On the same exhibit is also given a table showing the standard dimensions for such special castings as proposed by this Committee. Also, sketches of three and four-way branches, bends, flanges, and bells which we recommend for general adoption. The tables, we think, are sufficiently clear, and do not require much explanation.

The general thickness of metal as proposed is about the same as used commonly for gas street mains, or for water mains under 100 feet head of water pressure. We are aware of the fact that specials are often made a great deal heavier, but consider this extra weight of no benefit whatever to the gas companies, but rather as a detriment. Such castings should be no heavier than necessary, being frequently suspended along walls, or under the bottoms of purifiers or similar apparatus, or from girders, and are generally expected to act as much as possible as coolers of the gas.

We have throughout tried to conform as nearly as possible to the majority of patterns in use, even where theoretical considerations might call for a slight change.

As to the number of bolts required for the flanges of each particular size of pipe, we have adhered to the principle that the boltholes should "straddle" the center lines of templates, both vertically and horizontally, allowing the casting to be turned 90° without re-drilling. Theoretically, the spaces between the centers of boltholes should not vary in all flanges; practically, our standard does not vary over one-half inch from the medium space of 5½ inches, except perhaps in the case of flange of 6 inch pipe.

The thickness of flanges, as given in table, is meant "finished; an allowance for turning or planing will have to be made.

On Exhibit III. are also given shapes and dimensions for special castings generally required. The distance from center of inlet to back of bell or to face of flange of branches or bends has been kept a constant for every particular size of pipe.

After the adoption of these rules, an engineer, laying out a plan of pipe connections, may learn, by a glance at the table, what he will get when ordering a *regular* bend or branch, no matter from what foundry.

We now submit these rules for the action of the Society. Should they be agreeable to you we will send copies of the same to the manufacturers of gas works apparatus, and get these gentlemen to also adopt them. Our members will then be expected to insist upon "standard patterns" when giving out contracts for such apparatus, so that our rules may be enforced.

After that much has been accomplished we expect to extend our standard to "street specials," and try to induce the leading pipe foundries to conform with it. We would also ask them to cast their pipes of a uniform length, so as to measure 12 feet net, when laid. This measurement should apply to flange pipes as well as to ordinary bell and spigot pipes.

All of which is respecfully submitted.

A. H. Strecker,
E. Vanderpool,
A. B. Slater,
Committee.

*The letter, and the names of the firms to whom it was forwarded as well, are appended to this report.

APPENDIX.

The Society of Gas Lighting, at a recent meeting, appointed a Committee to look into the matter of special castings required by gas works, and to devise some means by which the patterns now in use by different manufacturers could be brought down to a uniform standard.

Castings made by different shops often vary considerably in size and template of flanges, or in depth and diameter of bells, and trouble, delay and expense are experienced when trying to join such pieces of different make.

We address these lines to you to learn whether, and to what extent, we may count upon your co-operation in bringing about the adoption of a uniform standard for such castings.

We would suggest that it would facilitate matters if you would send us sketches showing your regular patterns, so that we may compare them with others and try to make them harmonize.

Copy of circular letter addressed to: R. D. Wood & Co., Philadelphia; Isbell-Porter Co., New York; Jas. R. Floyd & Sons, New York; Continental Iron Works, Brooklyn, N. Y.; Davis & Farnum Mfg. Co., Waltham, Mass.; Morris, Tasker & Co., Philadelphia, Pa.; Bartlett, Hayward & Co., Baltimore, Md.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 781.]

FOURTEENTH ANNUAL MEETING OF THE WESTERN GAS ASSOCIATION.

HELD AT THE GALT HOUSE, LOUISVILLE, KY., MAY 20, 21 AND 22, 1891.

FIRST DAY—AFTERNOON SESSION.

The President—We will now listen to the paper, by Mr. E. H. Jenkins, of Columbus, Ga., entitled:

GAS ENGINES—SOME PRACTICAL RESULTS AND COMPARISONS.

In presenting the above subject to this Association, it is not my intention to go into the early history of the introduction of the gas engine, nor do I propose to enter into the details of construction and operation of these engines; neither shall I give a description of the different kinds or styles now in use, believing that each of you is sufficiently familiar with these details, that they do not need to be presented in this article.

I conclude that a paper showing where this kind of motor has its advantages, and enumerating the different superior points over other motors, giving data that can be used by any one and made applicable in any place, by simply comparing the price of gas on one hand, and coal, water or electricity on the other, in the different localities, might be of some slight advantage. I can assure you that there will be nothing particularly startling in the facts presented, and they may sound extremely tame; but I trust the discussion that may be brought out will produce some good, and may show to some of us a few points of interest on this subject.

For a number of years the writer has made a special effort to introduce, in the limited field of his operations, as many gas engines as possible; and the success attending his efforts has led to the conclusion that much could be done in this way to aid in the sale of gas in the daytime, if proper efforts were made on the part of many to place the merits of these engines before their customers in a concise, practical manner.

When I say to you that we sell over 8 per cent. of our entire output for this purpose, you can see it is a business that is well worth cultivating.

In the gas engines mentioned in this paper, ordinary 17-candle power coal gas was used, and in comparing them with smaller steam powers, the price of gas is placed at $1.25 per 1,000 cubic feet, that being the rate for gas sold for this purpose in Columbus, Ga. I have estimated in the steam work the average price of steam coal at the same place.

The price of materials mentioned in this paper will, of course, vary in different localities, but, as a rule, where coal is cheaper, gas can also be sold at a correspondingly lower rate.

Gas Motors Compared with Steam Engines—with Varying Loads.—In the following estimates I have taken, as nearly as I could, the average steam plant of the sizes named. I am fully aware that some steam plants of these sizes are run much more economically, but I also know of many others which do not begin to do so well.

In order to get a satisfactory result from a small steam plant, it is necessary to have the boiler somewhat larger than the engine.

Four H P. Steam Engine, 7 H.P. Boiler—10 Hours per Day.

Coal, 500 lbs., at $2.50 per ton	$0 62½	
Labor	25	
Oil, waste and repairs	12½	
Water, 350 gallons, at 15c. per M	05½	
Extra insurance, one-half of one per cent. on $4,000	06½	
Total, per day	1 12	
Per month, 26 days	$29 12	
Per H.P., per month		$7 28

Gas Engine (No. 3), 4 H.P., 10 Hours per Day.

Monthly average per H.P. for gas, at $1.25 per M	$3 90	
Oil and waste	60	$4 50
Saving per H.P. per month		$2 78
Saving per year, 4 H.P.		$133 44

Seven H.P. Steam Engine, 10 H.P. Boiler—10 Hours per Day.

Coal, 700 lbs., at $2.50 per ton	$0 87½	
Labor	50	
Oil, waste and repairs	15	
Water, 500 gallons, at 15c. per M	07½	
Extra insurance, one-half of one per cent. on $5,000	08	
Total, per day	$1 68	
Per month, 26 days	43 68	
Per H.P. per month		$6 24

Gas Engine (No. 1), 7 H.P.—10 Hours per Day.

Monthly average per H.P. for gas, at $1.25 per M	$3 25	
Oil and waste	60	$3 85

Gas Engine (No. 2).—Same as Above.

Monthly average per H.P. for gas	$3 00	
Oil and waste	60	$3 60
	$7 45	
Making average for the two engines		$3 73
Saving per H.P. per month		$2 71
Saving per year, 7 H.P.		$227 64

In the above estimates I have taken the actual result of each gas engine and computed on a 10 hours' basis. Where power is intermittent, say only needed 4 or 5 hours one day, none the next, and then, perhaps, 6 or 8 hours the following day, the saving would be even greater than shown above. In either of the cases mentioned the saving would pay the additional first cost of the gas engine in about three years.

Gas as Compared with Steam for Operating Electric Light Stations Controlled by Gas Companies.—This subject has, no doubt, been carefully considered by those who have electric stations in connection with the gas works, and in some cases, gas engines are now employed for this purpose with very satisfactory results.

I think the proper way to install a plant of this kind is, not to have one large gas engine, but rather three or even more smaller ones, using just what horse power is actually needed during the time the different circuits are in use. Another advantage is that the smaller engines are easily started and no "starter" engine is needed.

50 H.P. Steam Plant—12 Hours' per Day.

Coal, 4,200 lbs., at $2.50 per ton	$5 25	
Labor—engineer and fireman	3 25	
Oil, waste, etc.	40	
Total		$8 90

Gas Engines for Above.

Two 20 H. P. and one 10 H P. Engines.

50 H.P. from 5 till 10 P.M., at 20 cu. ft. per H.P. . 5,000 cu.ft.
40 H.P. from 10 till 12 P.M., at 20 cu. ft. per H.P. . 1,600 cu.ft.
30 H.P. from 12 till 5 A.M. at 20 cu. ft per H. P. . 3,000 cu.ft.

Total	9,600 cu.ft.	
9,600 cu. ft., at 50c. per M.	$4 80	
Oil and waste	20	
Labor	1 50	
Total		$6 50
Saving per day		$2 40
Saving per year		$876 00
Less 6 per cent. on $2,500 (additional cost of gas engines)		150 00
Net saving per year		$726 00

100 *H.P Steam Plant—12 Hours.*

Coal, 6 lbs. per H.P. per hour, 7,200 lbs. at $2.50 per ton..	$9 00	
Labor—engineer, fireman, etc.	6 00	
Oil, waste, etc.	75	
Repairs on boiler and engine.	30	
Total.		$16 05

100 *H.P. Gas Plant.*

Two 40 H.P. and one 20 H.P.

100 H.P. from 5 till 10 P.M., at 2,000 cu.ft. per hour..	10 000	
80 H.P. from 10 till 12 P.M., at 1,600 cu.ft. per hour..	3 200	
60 H.P. from 12 till 5 A.M., at 1,200 cu.ft. per hour..	6 000	
Total.	19 200	
19,200 cu. ft. at 50c. per M.	$9 60	
Oil and waste	40	
Labor.	2 50	
Total		$12 50
Saving per day		$3 55
Saving per year		$1,295 75
Less 6 per cent. on $3,700 (additional cost of gas engines)...		222 00
Net saving per year		$1,073 75

In both these estimates I have taken for granted that the steam plants do their own pumping of water. If water is purchased from the water works company, it will require about 4 gallons per H. P. per hour, which, at 12c. per thousand—a low average price—would add $105.12 per year to the 50 H. P. and $210.24 per year to the 100 H. P. engine. You will notice also that, in the quantity of gas used, the full amount—20 cubic ft. per hour—is figured, making no allowance for variation of load. I also place the price of gas at 50 cents per 1,000 cubic feet. There are very few gas companies but can make the additional gas needed to run an electric plant at the price named above, and many companies make it for a very small fractional part of this price. In most works no additional labor would be required and the return from residuals would nearly pay for all material needed. In such cases the advantage of gas power over steam is correspondingly greater.

You also have removed the danger of boiler explosion, or the stoppage of the plant from leaky flues, failure of pump or boiler feeder, broken steam pipe, etc., etc. I know of quite a number of steam plants operated by gas companies that produce much better results than those given above, as they are enabled to use coke breeze and screenings to a great extent. Yet I think that, even if the gas power costs nearly as much as steam, still it would be a very good example for the companies to set before the public, and might induce others to use gas for smaller powers.

Gas Power as Compared with Electric Power.—When we come to compare the cost of gas power with electric motors, we strike the same problem that we do in selling gas for lighting purposes in competition with the electric light, viz: That the electric companies, as a rule, do not consider the cost of producing the power they furnish, but simply make a price lower, if possible, than the existing gas rates. They manage to manipulate figures in a way peculiar to themselves, and in a great many cases not only convince the consumer that he is in the line of progress by adopting electricity as a motive power, but really prove to him that he is the gainer also. This is especially the case where electric companies are just starting out in this line of business, as they are extremely anxious to get sufficient income at the beginning to enable them to at least pay for the coal used.

The question naturally rises, should gas companies attempt to meet such prices by selling gas at—say cost in the holder? I think you will agree with me in saying "No." We had better lose for a time a part of such business, than to make the price so low that we would not feel justified in keeping it at such a figure for any length of time, but would expect to increase the price when electric companies found they would have to charge more.

The public are always ready and willing that the price of gas should be put down—the lower the better for them—but are never willing to have a raise in price, be it ever so little. Still, from the best information I can get, I believe that gas power can be furnished at a more reasonable price than electric.

For small powers there is now made a ½ H.P. gas engine that finds a ready sale. The cost of running same is about 1 cent per hour, 10 cents per day, or $2.60 per month—or at the rate af $7.80 per H.P. per month. For similar powers the electric companies charge from $8.00 to $12.00 per month per H.P. The average price for gas per H.P. per month in several cities is about $3.50, while electric companies charge from $4.00 to $7.00 per H.P. per month for motors, according to size. The great advantage in price that gas power has, is that the consumer pays for just what he actually needs and gets—if he only needs power one hour to-day and 14 hours to-morrow, he pays in that proportion—with electric motors he pays for 10 hours' service every day.

Again, gas power is much more reliable and is ready every hour of the 24—while electric power is subject to frequent interruption from changes of line, or the various peculiarities the current has of getting lost between the central station and the consumer.

As compared with water motors, gas engines can be run for from one-half to one-fourth the usual charges for such service, especially where a water meter is in use—in such cases the charges for water average from $10.00 to $15.00 per H.P. per month.

With the figures as shown herein, demonstrating that gas power has many advantages over steam, water or electricity in most cases, the question naturally arises, why is so little done in the way of pushing this branch of the business?

There are two main obstacles to contend with: 1st, the cost of gas engines; 2d, the price charged for gas.

In regard to the first named, the prices charged for gas engines are entirely too much, in fact, out of all proportion. Gas engine builders continually cry, "Put down the price of gas!" but they never consider the advisability of reducing the price of the engines. A 4 H.P. steam engine and boiler complete can be purchased for say $270.00, and a 4 H.P. gas engine alone costs $620.00, or 130 per cent. more than the steam plant.

A 50 H.P. steam plant can be purchased and set up for $1,600.00, while two 20 H.P. and one 10 H.P. gas engines would cost $4,100.00, or 156 per cent. more than the steam plant. Gas engines ought to be furnished for what a first class steam engine of same power would cost. Compared with the cost of electric motors, they are as follows:

	½ H.P.	¾ H.P.	1 H.P.	4 H.P.	7 H.P.	10 H.P.	20 H.P.
Gas Engine....		$180	$280	$620	$780	$1010	$1550
Electric Motor..	$32	90	160	425	600	700	1100

It will be seen that gas engines cost a great deal more than any other power named.

Cannot some way be devised to remedy this obstacle.

As to the price of gas, very few gas companies are now charging more than $1.50 per 1,000 for gas for this purpose, and quite a number are selling at $1.00 per $1,000. The cities where gas cannot be sold for $1.25 for gas power are very rare.

In conclusion, I will say that a little persistent effort on the part of the gas manager, keeping posted as much as possible in regard to the probable requirements of the users of small powers, and letting them know occasionally that the gas company is existing solely in order to give them a cheap power when they need it, will surely bring good reward.

Discussion.

The President—The paper we have just heard read is one well worth preserving, and one that we will all want to take home with us thereafter to refer to it. It is now before you for discussion.

Mr. Darrah—I would like to ask Mr. Jenkins as to the cost of repairs to a gas engine.

Mr. Jenkins—A gas engine requires but very few repairs. We have eleven in operation in Columbus at the present time, and the repairs on the entire number amount in cost to a very small number of dollars per year. The slide valve on a gas engine ought to be changed once a week, and it takes about 15 minutes to do that. Otherwise, I might say, the repairs on a gas engine are almost *nil.*

Mr. Thompson—Has there been any charge for the water used in the operation of the gas engine?

Mr. Jenkins—The amount of water used can be regulated by the consumer. If the water works company charge you for the water, you can easily erect a tank permitting the stored water to circulate through the tank, and the water not get hot enough in a 10 hours' run to interfere with the working of the engine. That is done in many places where there is no regular water supply. In Columbus the charge for water for a 7-horse power gas engine is $1.25. We can use very little water, or we can use a great deal.

Mr. Stratton—I notice that Mr. Jenkins gives the price of gas at $3.90 per month per horse power. Multiplying that by four would make it equal to the cost of steam. I also notice that he puts the cost of running ½-horse power gas engine at $2.60 per month. The figures don't seem to check.

Mr. Jenkins—If you will look further you will see that steam is figured at $29.12 per month for a 7-horse power boiler and 4-horse power

steam engine, making, for 1-horse power, $7.28. Then I compare it with the monthly average for 1-horse power gas engine at $4.50. The total cost for 4-horse power gas engine would be $18 per month. I figure down to 1-horse power in each instance; and comparing the two, I find it makes a difference of $2.78 per month in favor of gas. I will state that a ½ horse power gas engine will take more gas in proportion than a large engine; and that is why I figured it at $7.80 per horse power per month.

Mr. Boardman—What we want to arrive at in these things is the actual fact, and our figuring should cover margins against ourselves. The criticism I would make on Mr. Jenkins' figures is that he has figured on a 100-horse power steam engine, running at full power for 12 hours, while he has figured the power of his 100 horse power gas engine at 100-horse power for five hours, 80-horse power for two hours, and 60-horse power for five hours. I think that a correction in proportion ought to be made for the steam engine, because the power consumption of a steam engine of modern make, where the amount of steam used is regulated by the load it carries, would be even more perfect than that of a gas engine approximately. I think the same allowance should be made for the steam engine as for the gas engine in computing the amount of coal used. I also think that a correction shou'd be made with regard to the cost of a steam engine of 50-horse power, and the cost of two gas engines of 20 horse power and one gas engine of 10 horse power. He should also calculate for two 20-horse power and one 10-horse power steam engine. That would make the cost of the steam plant the same in proportion. So that while in the one case it will figure against us, in the other case it will be more in favor of the gas engine, as shown in this paper. Those are two points which I think that Mr. Jenkins will recognize should be taken into account.

Mr. Jenkins—I will say with regard to the 20-horse power engine that I have the figures from quite a number of parties, and the figures I have given are the average consumption of gas. If they use their steam plant for 12 hours they will use so many hundred pounds of coal in so many hours per horse power. The corrections for varying loads have been taken into consideration. Speaking some days ago to a gentleman who operates a 300-horse power plant, as to the average of coal per horse power used, I was told the average was 7 pounds. I have figured at 6 pounds.

Mr. A. S. Miller—Mr. Jenkins has taken as an illustration a very good form of gas engine, for it is a good gas engine that will run on 20 feet of gas. I think he might take an equally good steam plant. Six pounds of coal per horse power would be considered a very poor steam result. In many cases, with the most improved plants, they get below two pounds; and anyone who would put up a new plant that would not run on four pounds per horse power per hour, for a 100-horse power steam engine, would have a very poor plant.

Mr. Boardman—With regard to the amount of coal used per horse power per hour, I think the gentleman who last spoke is about as far wrong, perhaps, in one direction, as Mr. Jenkins is in the other, even with the improved steam engines which are used for this purpose. In the first steam plant that I put up I used fully six pounds per horse power per hour, and more. My recent experience with a Corliss engine is that I use about 3¼ pounds of coal per horse power per hour, in actual work. This may not be as good as can be done, nor is it as good as can be arrived at with hard coal for fuel: but in cases where we are concerned I think that 3¼ or 3½ pounds per horse power per hour is about as good a result as we can hope for in actual work. I do not mean that during the actual running of the engine so much coal is used, but I do mean that from the time the fire is started until it is put out that will be the result.

Mr. Graeff—I think that can be satisfactorily settled, because Mr. Jenkins has left a margin in that 100-horse power gas engine. He uses half a millon feet of gas per month, for which he charges 50 cents per 1,000. Had he read a paper recently published he would have found that he could make 1,000,000 feet of gas per month at 30 cents per 1,000. Therefore, Mr. Jenkins ought to be allowed, as against the lower cost of a steam plant, this extra 20 cents per 1,000 for gas.

Mr. Jenkins—I have stated in my paper that I have given an average. I do not claim it to be absolutely accurate.

On motion of Mr. Stratton a vote of thanks was given Mr. Jenkins for his paper.

Report of Finance Committee.

The President—As it is too late to take up another paper to-night I will ask if any committee is ready to report. I believe that the Finance Committee have a report, which Mr. Jenkins will read.

Mr. Jenkins read the following report of the Finance Committee, which was, on motion of Mr. Thompson, received and placed on file:

Louisville, Ky., May 20th, 1891.

To the President and Members Western Gas Association: Your Committee appointed to examine the books and vouchers of the Secretary and Treasurer beg leave to report that they have performed that duty. We find the books neatly and correctly kept. The receipts and expenditures are as follows:

Receipts

Receipts for fees	$255 00	
" dues	420 00	
" sale of badges	217 75	
Balance from report of 1890	104 31	
Total		$997 06

Disbursements.

By Secretary's salary	$400 00	
" sundry bills, as per vouchers	400 15	
" balance, cash on hand	196 91	
		$997 06

Respectfully, E. H. Jenkins, I. S. Post, } Committee.

Mr. Harbison—As President of the American Association I would like to request the members of the Council of that Association to attend the annual meeting in the blue parlor immediately after the adjournment of this session, to make preparations for our October meeting. Also, as chairman of the general World's Fair Committee, I request the members of that committee to meet in the same place, to-morrow morning at 9 o'clock sharp, so that we may have a session before this convention comes together.

Mr. Jenkins—I would like the Committee on the President's Address to meet in the Secretary's room immediately after this meeting.

Mr. Lansden—I will ask the Committee on Nomination of Officers to meet immediately after the adjournment of this meeting.

The Association then adjourned to Thursday, May 21, at 10.30 A. M.

Second Day—Morning Session.

The Association met at 10.30 A.M. The first business was the calling of the roll.

ROLL CALL.

Honorary Members.

Harbison, John P., Hartford, Conn.	Slater. A. B., Providence, R. I.
Humphreys, C. J. R., Lawr'nce, Mass.	Thomas, J. R., New York, N. Y.
Leach, H. B., Taunton, Mass.	White, W. H., New York, N. Y.

Active Members.

Ambrose, J. S., Springfield, Mo.	Littleton, A. W., Quincy, Ill.
Barret, A. H., Louisville, Ky.	Lynn, J. T., Memphis, Tenn.
Bauer, T., Fort Scott, Kan.	McGauley, P., St. Louis, Mo.
Baxter, I. C., Detroit, Mich.	Miller, A. S., Omaha, Neb.
Blodgett, C. W., Brooklyn, N.Y.	Montgomery, J., Sedalia, Mo.
Boardman, A. E., Macon, Ga.	Morgans, W. H., Pontiac, Mich.
Bolcom, H. C., Winona, Minn.	Murdock, G. T., Elkhart, Ind.
Burns, G. B., Bowling Green, Ky.	Murdock, J. W., Ottawa, Ill.
Butterworth, C. W., Florence, Ala.	Odiorne, W. H., Springfield, Ill.
Butterworth, I., Columbus, O.	Penn, J., Washington C. H., O.
Canby, R. H., Bellefontaine, O.	Perkins, B. W., South Bend, Ind.
Clark, W., Drexel B'd'g., Phila.	Post, I. S., Chattanooga, Tenn.
Coverdale, R. T., Cincinnati, O.	Prichitt, S., Nashville, Tenn.
Cowdery, E. G, Milwaukee, Wis.	Printz, E., Zanesville, O.
Darrah, S. M., Wheeling, W. Va.	Rowe, J. J., Cairo, Ill.
Doan, F. M., Jacksonville, Ill.	Runner, Z. T. F., Freeport, Ill.
Dunbar, J. W., New Albany, Ind.	Sellers, W. B., Covington, Ky.
Egner, F., St. Louis, Mo.	Shaffner, S. C., Louisiana, Mo.
Ferrier, J., Eufaula, Ala.	Shelton, F. H., Phila., Pa.
Fitz, R. A., Elgin, Ill.	Somerville, J., Indianapolis, Ind.
Foster, T. G., Montgomery, Ala.	Stanbery, F. H., Pekin, Ill.
Freese, F. W., LaPorte, Ind.	Steinwedell, W., Quincy, Ill.
Gerould, H. T., Jeffersonville, Ind.	Stratton, J. W., Valparaiso, Ind.
Gimper, J., Leavenworth, Kan.	Tayler, G. H., Warren, O.
Glover, J. B., Jr., Joplin, Mo.	Thompson, G. T., St. Louis, Mo.
Jenkins, E. H., Columbus, Ga.	Tracy, W., Alton, Ill.
Johnston, W. J., Fort Smith, Ark.	Wallace, W., Lafayette, Ind.
Keller, C. M., Columbus, Ind.	Ward, B. A., Michigan City, Ind.
Keenan, N. G., Cincinnati, O.	Wells, G. H., Nashville, Tenn.
Knight, C. S., Fort Wayne, Ind.	Wilkiemeyer, H., Portsmouth, O.
Lansden, T. G., Washington, D.C.	Wilson, W. M., Hot Springs, Ark.
Lindsley, E., Cleveland, O.	Yuille, G. A., Chicago, Ill.

Associate Members.

Bradley, C. D., Chicago, Ill.	Newman, C. V., Chicago, Ill.
Cressler, A, D., Fort Wayne, Ind.	Osius, G., Detroit, Mich.
Dell, J., St. Louis, Mo.	Persons, F. R., Chicago, Ill.
Graeff, G. W., Jr., Phila., Pa.	Prentice, A. T , Chicago, Ill.
Guldin, O. N., Fort Wayne, Ind.	Ranshaw, H., Cincinnati, O.
Harper, H. D., Chicago, Ill.	Roots, D. T., Connersville, Ind.
Harris, J. A., Phila., Pa.	Russell, D. R., St. Louis, Mo.
Higgins, C. M., Cleveland, O.	Russell, T. G., St. Louis, Mo.
Howard, L. J., St. Louis, Mo.	Skinner, J. M., Cincinnati, O.
Hubbard, H. M., Chicago, Ill.	Smallwood, J. B., Battimore, Md.
Long, J., Louisville, Ky.	Smith, A. M., Cincinnati, O.
McDonald, W., Albany, N.Y.	Stout, J., Chicago, Ill.
McIlhenny, J., Phila., Pa.	Stratton, S. S., Chicago, Ill.
Morrell, E. E., Chicago, Ill.	Weber, O. B., New York, N.Y.

ELECTION OF NEW MEMBERS.

Mr. Lindsley, from the Committee on Applications for Membership, presented a report recommending the election to active and associate membership of the following:

Honorary Member.

F. E. Barker, Boston, Mass.

Active Members.

Buck, E. H., Vincennes, Ind.	Miller, C. R., Marquette, Mich.
Cathels, D. L., Louisville, Ky.	Miller, W. B., Cartersville, Ga.
Cline, J. W. R., Springfield, O.	Powell, C. S., Richmond, Ky.
Corley, J. A., Owensboro, Ky.	Ridgely, E., Springfield, Ill.
Cullinane, J. R., Denison, Tex.	Rodgers, J. F., New Decatur, Ala.
Dicky, R. R., Dayton, O.	Russell, C. P., Galveston, Tex.
Eaken, E. C., Jeffersonville, Ind.	Swann, H. R., Louisville, Ky.
Forbes, J,, Chattanooga, Tenn,	Turner, T., Charleston, S. C.
Franzheim, A. A., Wheeling, W. Va.	Warmington, D. R., Cleveland, O.
Jones, E. C., San Francisco, Cal.	Williamson, J., Chicago, Ill.

Associate Members.

Bankhouse, M. W., Louisville, Ky.	Irvin, E. S., Louisville, Ky.
Bissell, W. G., Chicago, Ill.	Logan, W. J., Brooklyn, N. Y.
Bradford, G., Chicago, Ill.	McFadden, W. H., Phila., Pa.
Essick, W. S., Royersford, Pa.	Moses, F. D., Chicago, Ill.
Hayward, S. F., New York, N. Y.	Worcester, F., St. Louis, Mo.

On motion of Mr. Montgomery, the Secretary was instructed to cast the ballot of the Association for their election. This having been done the President introduced the newly-elected members to the Association.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. Jenkins, chairman of the Committee on the President's Address, read the following report:

To the Members of the Western Gas Association: Your committee, to whom was referred the President's address, beg leave to report as follows:

We commend to the Association the care and thought exhibited by the writer in the preparation of this paper. Regarding the subject of over-capitalization of gas companies, the committee heartily agree with the President in this matter, and believe that, where possible, an effort should be made to have the capital stock of gas companies of a reasonable amount, to be based upon the actual worth of the plant, which should correspond to the amount of business to be done by the company, thereby decreasing the amount to be earned for interest on the capital invested and reducing the cost of manufacture of gas. We think that if the question of over-capitalization was fully considered by gas companies, and an effort made to sell gas of good quality at the lowest price consistent with the earning of a fair return on the investment; and the placing of proper facts before the public, showing the usual procedure and final results of such raiders, viz., the consolidation of the companies, and increased charges made necessary by the exceedingly large amount invested in the two or more plants, will tend to prevent to a great extent the forming of opposition companies.

In those States that gas commissions can be formed, similar to the one now in existence in Massachusetts, we think such a procedure advisable, and that proper steps should be taken at as early a date as possible.

We heartily endorse the recommendation of the President that Mr. B. E. Chollar be invited to give this Association, at its next annual meeting, an exhibition and lecture in connection with his arrangement of photometer, as designed by him, believing that such an exhibition would be of great interest to the entire membership.

In regard to the recommendation by the President that the annual dues be raised to $5, and the admission fee be made $10, we suggest that the annual dues be made $5 and the admission fee be placed at $5 instead of $10, as recommended.

We endorse the recommendation of the President that the standard ton of this Association shall be 2,000 pounds.

We suggest that the letters of Mr. Geo. W. Graeff, Jr., and Mr. E. C. Brown, be referred to the Board of Directors, as we think it is their duty to consider such questions. Respectfully,

E. H. JENKINS,
I. S. POST,
GEO. I. MURDOCK,
WM. STEINWEDELL,
} Committee.

Mr. Lansden—I move that the report be accepted.

Mr. Harbison—I would ask the chair whether the acceptance of the report of the committee will carry with it the adoption of the recommendations made by the committee?

The President—It will.

Mr. Harbison—Then, as a member of this Association I want to raise my voice against one recommendation, namely, that which the President called attention to, and which the committee endorse, with respect to changing the standard ton of coal to 2,000 pounds instead of 2,240 pounds. This Association has put itself on record in behalf of a uniform system of keeping accounts. Most of the members of this Association are also members of the American Association, and some who are members of other Associations are also members of this. How can a uniform system of accounts prevail amongst the fraternity if this Association is to fix the ton of coal at 2,000 pounds, when all the others have fixed it at 2,240? They must keep a new system of accounts. I think this recommendation is a great mistake. All through New England and the Central States 2,240 pounds is the standard. I think there are serious objections to a change, and I hope that the recommendation of the committee will not be adopted by this Association. A ton of 2,240 pounds is the standard adopted by the American Association, and the American Association represents the entire continent. You will not have any uniform system of accounts for purposes of comparison, if this Association sets up for itself a system of keeping accounts on the basis of 2,000 pounds per ton. It is a pretty serious matter. If these Associations are worth anything to us as members it is in order that we may be able to make comparisons one with another as to what we are doing; and we cannot make comparisons if you base your results on a ton of 2,000 pounds when we base ours on a ton of 2,240. I cannot see any advantage to be derived to members of this Association by changing to 2,000 pounds per ton in keeping your accounts. I would be glad to hear any member of this Association, or as many members as think there is an advantage in it, express their opinions in such a way that every member will hear what is being said. It is a matter which ought to be fully understood by every member before a vote is taken; and I hope that we shall hear from a great many.

The President—I want to say a few words in reply to Mr. Harbison. I carefully considered this matter which I recommend to you, and I shall not repeat the arguments which I made in my address. I believed I was right then, and I still believe that I am right. As to the members of the American Association, I would like to say that they are rapidly becoming members of the Western. If they do not become active members we will take them in as honorary members. We will have them at all events as soon as we can; and then the American Association will not count for anything. Those who are not already members of the Western Association can easily make the comparisons. I will say no more, for fear of hurting Mr. Harbison's feelings.

Mr. Harbison—My feelings in a matter like this are not easily hurt. I do not want you to keep back anything out of sympathy for my feelings. Make the very best argument you can in favor of this recommendation, and never mind my feelings. As the President of the American Association I can stand a great amount of that sort of thing; and as an individual I think I have some courage, so let no brother fear that he may hurt my feelings in what he may say.

The President—We all know Mr. Harbison well. There is not a spot in the United States where he is not known, where gas men meet, and we all esteem him highly. If we vote contrary to what he believes is best, he must not think that we esteem him personally any less highly; but we are going to vote him down this time just the same.

Mr. Dunbar—I am in favor of adopting the recommendation and changing the standard to 2,000 pounds, for the reason that in the West we all buy our coal at that weight per ton. As you suggested in your address yesterday it requires a change in all our calculations if our comparisons are made on a basis of 2,240 pounds. The Western

Association, I assume is destined to be the banner Association of the country (applause); and we should take the lead in this matter. The gentleman who has just addressed us in favor of maintaining the rate at 2,240 pounds claims that the gas men of all New England, and some of the Middle States, buy their coal at 2,240 pounds per ton. In answer to that let me say many of the Western States in area are larger than the whole of New England (applause), and together constitute a portion of the country which greatly exceeds the area which the gentleman has mentioned. I think, therefore, in justice to ourselves, and in respect to ourselves, we ought to change and adopt the standard of weight which is most convenient and best for ourselves. As a member of the Western Association I am in favor of doing that which we deem best, and not permitting ourselves to be controlled by the wishes or rules of any other Association.

Mr. Lansden—When this Association was organized the standard adopted was 2,000 pounds per ton. I want to ask when it was changed to 2,240?

The President—I do not know, but I believe that Mr. Harbison was present when it happened, and that his eloquence brought it about. Nobody else could have done it.

The Secretary—This change was made at the meeting in St. Louis, in 1887.

The President—The question is on the report of the committee on the President's address. The adoption of the report carries with it the recommendations contained in the report.

The report was adopted.

A resolution amending the bye-laws so as to cause the initiation fee to be put at $5 and the annual dues at $5 was prepared by the Secretary, who notified the members that a vote on the same would be taken on the following day.

Mr. Walton Clark, of the committee, then read the following report:

REPORT OF COMMITTEE ON WORLD'S FAIR.

Mr. President and Members: Since your committee was appointed, important decisions affecting the gas interests of this country have been arrived at by the executive body of the World's Fair. The electric light companies have bestirred themselves to obtain the exclusive lighting of the Fair, and to relegate gas to a subordinate position. The result has been all that they could ask, and all that we could have feared. It has been much worse than we had any reason to expect.

In a recent publication the executive body controlling the World's Fair has announced that the lighting will be done by electricity exclusively. That gas will be used as little as possible, and only where necessary for the exhibit of gas engines, etc. That gas for lighting will be used, if at all, only late in the night, and presumably after the electric lights had been turned out.

It is unnecessary, probably, for us to enlarge on the effect this will have upon the gas industry. It will affect us individually, in that it will discourage manufacturers of gas appliances and reduce the educational value of a visit to the World's Fair by gas men; but more profound and disastrous will be the effect upon the stockholders, whose interests are in our charge. The effect on the values of gas securities will be unfortunate, for investors witnessing the magnificent display of electric light appliances, and impressed by the absence of gas, will be led to the conclusion at which electricians desire them to arrive—that gas is a back number, and electricity the light, not only of the future, but of the present.

It is evident that the interest of the investor is greater than is the interest of the gas engineer in having a display of value of gas as an illuminating and heating agent that shall be a credit to the profession and to the industry we represent.

The necessity of action is evident. The enemy has moved into a position of his own choosing, and it is a commanding one. It is not probable that we can dislodge him, but it is certain that the right action taken by us and our brethren of other Gas Associations will result in nullifying, to a great extent, the strategy of the electricians.

The work we want done, all experience teaches, will never be done by the combined effort, or lack of effort, of the numerous committees that have been appointed by various Associations.

It is notorious that work to be done by large bodies is done, if at all, slowly. It is also evident that nothing can be done without money. We must contrive to get a sufficient sum of money into the hands of a few men who have our confidence and will have the confidence of gas engineers and investors, and let them handle the matter.

A vigorous policy must be carried out, and the Western Association, having several representatives on the general committee of the American Association, has delegated to it all its powers as far as relate to the World's Fair, and given up individual action in the matter. The other Associations have done the same.

No effective work can be obtained without money. The American Association has none, the others have little. Where can the necessary funds be obtained? Obviously the proper people to subscribe the funds are those who are mostly interested in the attainment of the object to which these funds will be applied. These are the gas companies of America, and they should be liberal subscribers.

It needs no argument to show that there should be no appeals to manufacturers of gas appliances for money. Surely the gas companies will, for their own protection, now that the threat is openly made and the danger imminent, subscribe to a fund to be handled by the Committee of the Gas Associations of America.

We hope that the Western Association will urge upon the general committee the importance of soliciting funds for the carrying out of a plan to be presented to the consideration of subscribers at the time of obtaining subscriptions.

We suggest the following as appearing to us worthy of consideration in connection with the plan of operations.

It is certain that manufacturers will have on exhibition all the forms of gas utilization appliances and gas manufacturing apparatus, either in the model or by means of diagrams, that are known to the art. We need not concern ourselves about that. What *we* most desire is an exhibit that will instruct and give the visiting public a correct idea of gas service in the generation of power, lighting of streets, and particularly in domestic economy. To insure this involves the exhibition of lighting, heating, cooking and power appliances, in operation for at least a part of each day. The advantages possible to manufacturers from this display guarantee their contributing apparatus as asked for. Gas stoves and water heaters with test meters and bakers' thermometers attached, engines with meters and prony brakes, all ready for operation in a place certain to be visited by every man interested in gas works and visiting the Fair, and by tens of thousands of curious consumers of gas, would give the manufacturers more of an advertisement than they could otherwise obtain with an expenditure of an hundred times what this exhibit would cost them. The utilization appliances set conveniently for exhibition purposes, and in charge of competent attendants, the spaces brilliantly lighted at night by high power, regenerative, incandescent, and other forms of burners; everything arranged for convenient testing, and explained by cuts and text; these should make an impression upon a consumer that would result in good to the local company supplying him. There should also be an impressive illumination of the space occupied by us—a display that can be compared with the electric display to our advantage.

Of one fact we are assured, the general committee of the Gas Associations *must* do all that is to be done for the gas industry. If our ideas meet your favor we hope you will recommend them to the consideration of the general committee.

The President—You have heard the report of the committee, and it is now before you for discussion.

Mr. Gimper—I move the acceptance of the report.

Mr. Lansden—If the acceptance of the report carries with it the recommendation of the Western Association I wish to oppose it in my feeble way. I do not see what the Western Gas Association has to exhibit in Chicago. I can understand that if gas were being burned by everybody all over the United States, then every man interested in any department of the business would desire to make an exhibit. The proprietors of the Lungren burner would exhibit that burner, a man or firm owning another style of burner would be sure to take it there, and the man who has the best gas stove would want to exhibit it, but I cannot see where the Western Gas Association has one particle of right to even put itself on record with regard to the matter. It will take money to do it. We are here as gas engineers, as manufacturers of gas. I have always been opposed to suggesting to my President, or to the Board of Directors of my Company, what is the best method or way of manipulating their capital, or how to best manage the various matters connected with the financial part of the business. I must say I cannot see where we have any right or duty to subscribe one dollar, or to ask our companies to do so, for the sake of advancing the interest of any individual in respect to machinery connected with the gas industry, or to devote any money to maintain a few exhibitions of gas appliances.

Mr. Cowdery—Some of the members of the Association have heard the report read by Mr. Clark, but I am afraid some of those in the back part of the room have not heard it, and therefore I do not think it is fair to take a vote adopting the report before all the members know what it contains. I do not believe in the Association furnishing any money to carry on this exhibit. I fail to appreciate the utility of so doing.

I would not be in favor of it myself, nor would I wish to ask my Company to furnish any money. I think it is the duty of the manufacturers who want to place an exhibit in that Fair to unite in the endeavor to place their exhibits so as to be to the greatest possible advantage of gas companies; but I see no need for this Association to furnish money which has been contributed here by us personally, and I see no need of calling upon gas companies to furnish an exhibit to the World's Fair.

Mr. Clark—It is evident from Mr. Cowdery's remarks that he did not hear the report. Perhaps it would be better for him to read it again before discussing it. There is no idea on the part of anybody that this Association shall contribute any money for the World's Fair. It is certain that the manufacturers will, as Mr. Lansden has stated, have their exhibits there, but there is danger that they will be scattered about. The electricians, who are our competitors, are going to make a united effort, and they are going to make a grand display. We must do one of two things: We must either take a back seat, and say that we cannot compete in that sort of a display with electricity, or we must get money, and put that money into the hands of a few of our men who have our entire confidence, and let them take such measures as will secure a display in our interest which shall compare favorably with that of the electricians. It is not a question as to whether we will have a certain meter, or a certain burner, or a certain retort exhibited; but the question is, Is the gas industry going to get a black eye at Chicago, or is it not? The gas industry will get a black eye if the electricians carry out their plans, and we do nothing.

Mr. Montgomery—Who will make the electrical display?

Mr. Clark—The electric lighting companies and the people who sell electrical apparatus. The men most interested in electric light in this country are those who sell electric apparatus. As a general thing stock in local electric light companies is held by the manufacturers of apparatus. But it is not so in the gas industry. The men interested in the stock of local electrical companies are doing this work in great measure; and that is what ought to be done by the gas companies.

Mr. Somerville—Mr. Clark seems to think unless the gas industry is represented at the Fair after the plans preparing by the electricians, we will receive a black eye, as he terms it, and gas securities will consequently be depressed in value. I doubt this. Every municipality in this country has been giving us black eyes all around, and yet to-day gas securities are just as good as ever they were, if not better. I do not believe that what may be done at Chicago will affect the price of gas securities one whit. Gas is the poor man's friend, and the poor will have it. The Great Teacher has said that the poor will always be with us; and so we shall always have some customers for our gas.

The President—Are there any other remarks on the adoption of the report of the Committee?

Mr. Harbison—Perhaps you will let me say a word on this subject. I may say I have been honored with the appointment of the chairmanship of the World's Fair Committee by the membership of the various committees representing the various Associations, and the action of the Associations in naming their members on this general committee was under the specific vote of your Association, which took similar action, that the Association should not pay any expenses, or any money towards that exhibit, excepting the actual expenses incurred by the members, which would reduce the amount to be paid by this Association to a minimum. As a member of that committee I would object to Mr. Clark's recommendation in which he says that that committee ought to endeavor to raise some money from gas companies with reference to paying the expenses that might be incurred in Chicago. I do not believe that it is any part of the duty of that committee to raise money that may or may not be needed. It would be their province and duty, as I understand it, to try to arrange for suitable space at Chicago for a proper gas exhibit; and in addition to that, after having secured space, then if possible to arrange for a subdivision of that space in an impartial and fair manner to the various exhibitors. I apprehend that that is about as far as that committee will have any authority or power to act. First of all, to try to secure the desired space; have that space subdivided in such a way that no manufacturer will have an advantage over his competitor. That money could be used to good advantage in assisting in the work, I have no doubt; but if money is raised, I think it should be done by a finance committee to be appointed by each Association, specially delegated for that specific work, and not attempt to put the burden of raising money upon the committee already appointed. For one I would not be willing to assume that duty. But if a finance committee was appointed to solicit funds from gas companies to help pay their share of the expenses which might be incurred at Chicago in the promotion of our industry, then I think they would respond; and I hope that this Association will not adopt that recommendation; but that a special finance committee may be appointed by this Association, composed of two or three active members, who would know the people who are represented by this great, growing and glowing Western Association which is one day to become a star in the firmament. (Applause). Notwithstanding the fact that the American Association covers even more territory than the Western, and that, too, without even including little New England, which, although not very large in territorial limits, is mighty where it is, and mighty throughout the land wherever its influences are felt. I honor the brothers who have spoken in behalf of the Western Association—and they cannot say too much for the Western—but let them just remember that there is something else besides.

Mr. Lansden—I would like to inquire in what way the gas exhibit is to be made in Chicago. What method could be adopted by which a gas exhibit could be made in Chicago, without using some one man's gas stove, and some other man's improved burner? As there are so many of these I think it would be an endless and hopeless job for any committee to undertake to say who should have precedence. Somebody is bound to have it; but I think it would be very unfortunate for the Western Association to instruct this committee that they shall take this thing out of the hands of the manufacturers, or have anything to do at all in a financial way with the gas exhibit in Chicago, on the ground that there are so many burners and so many stoves, each owned by parties who have the right to demand space in the exhibition, and who failing to obtain a prominent position under the patronage of this committee, might take other means to secure it. I must say that I cannot see where the Western Gas Association can take any part, officially or otherwise, in this matter.

Mr. Clark—It is evident that the report of the committee has but few friends in the Western Association. Our idea was to prevent this scheme of a gas exhibit at the World's Fair from being strangled by red tape. If we adopt the suggestion of Mr. Harbison, and the different Associations go around asking money from the companies, which money shall be turned finally into a general fund, we shall have considerable red tape to handle before we can get the money where it will do any good. We can empower a few men, a general committee representing every Association in this country, to collect such moneys as shall be necessary, and then to make an exhibit that will be a credit to us, and will compare favorably with what the electric light men are certainly going to do. It is not necessary to consider the question of whose stoves or whose burners we shall use in this exhibit. It is not a question of advertising any man's gas appliances. It is a question of advertising *gas*. That is the one thing in which every company which we represent here is interested; and it is our duty to do what we can at the World's Fair towards advertising gas. Your committee very much fear that if definite action is not now taken looking towards the raising of funds and putting them in the hands of men who are known to be efficient, and who are known to be competent to handle them in the right way, the whole thing will flat out and die of strangulation by red tape.

The President—I really can see no reason why Mr. Clark's report should not be adopted. It does not commit us to any expenditure of money at all. He recommends that the members of the Association shall pass a resolution to contribute. If the companies do not contribute, after being informed as to why this co-operation is asked, then they will not contribute, and the thing falls flat—like the Gas Institute that we wanted to put through some years ago. We wrote to every gas company in the country, and got promises of assistance; but it fell through. I see no reason why Mr. Clark's report should not be adopted, because it commits us to nothing at all. I also want to say that I admire Mr. Harbison's way of getting out of the argument—by saying that he had no vote. We will let him vote any time he wants to; but in that instance the majority was right, just the same.

Mr. Cowdery—My objection to the adoption of the report of the committee is that I have not heard it, and I shall certainly vote against it because I do not know what the report contains. I think many members are placed in the same situation.

The President—You can take my word for it—it is all right; it don't commit us to anything. I hope you will vote for it.

Mr. A. S. Miller—I believe committees were appointed by the different Associations, that were practically without instructions except as regards expenses. I think these committees are made up of pretty wise men. They are appointed to take charge of this thing. It seems to me if this report embodies their ideas we had better let them go along and do as they think best. They have certainly given more time and study to this subject than any other individual members of the Association; and we ought to adopt their report and encourage them to that extent. Wo do

not commit ourselves to anything. The report is practically of no force. It does not bind the committee. They already have power to do as they please; and all we have to do in the matter is to give them a little encouragement by adopting their report.

Mr. Boardman—It seems to me that as many of the Association did not hear that report, and as there seem to be very good reasons on both sides, in favor of as well as against adopting it, it would be well to give it a little more time for consideration. I am myself a little opposed to asking gas companies to contribute to the expense of an exhibition of gas appliances. I also represent an electric light company, and I certainly shall not ask any contribution from the funds of that company for the purpose of securing an exhibition of electrical appliances. Why, as President of a gas company, should I be asked to do that which I would not do as President of an electric light company? We stand on a very different plane, as gas companies, from those companies who expect to exhibit their appliances for electric lighting, at the World's Fair. All of these electrical appliances, and almost all the electric lighting companies, are largely controlled by two or three extensive corporations, who are more interested, I am sorry to say, in selling apparatus, than they are in the success of the local companies. If we also controlled the manufacture of gas engines, gas stoves and gas burners, and held stock in local companies as collateral for the indebtedness of those companies for the material we sold them, it might then be well for us to call on the gas companies to help us out with funds to make this exhibition. It seems to me the province of the committee from the Gas Associations is not to select certain appliances to be exhibited at Chicago, but to get as many as possible to exhibit there, to secure as much space as possible, to help organize, and to see that appliances manufactured in our interest are well represented and exhibited. We should aim at that and not try to do it ourselves. For myself, I think that money sufficient to pay the actual expenses of the committee in endeavoring to accomplish that end would be sufficient to be saddled on the Associations. But in order to give more time for reflection and consultation, and an opportunity for reading the report (which has not been heard by a large number of members), I move that the consideration of the matter be postponed until this afternoon.

Mr. Harbison—I do not want any misunderstanding about anything that I may have said, for the only point of difference between Mr. Clark's report and my own views is as to the raising of the money that might be necessary. His report suggests or recommends that this general committee raise the money. I think we have duties enough now to perform in behalf of the gas industry, without putting that burden upon us. It is specially provided that the members of the general committee shall not receive any pay for their time or any compensation for their services, and I am sure there is not a man appointed on the committee who would serve if there had been compensation for services included in the appointment. I am quite sure that I would not. Any time that I may be able to devote to the interest of the industry in the way of an exhibit at Chicago, will be gratuitously given. The appropriation of money simply covered the actual expenses to be incurred by the committee, which did not mean that the eleven men appointed on the committee were going to make a trip to Chicago, but that an executive committee of two or three members be appointed to go to Chicago, and thus make the expense as light as possible. I do not agree with what brother Lansden has said. He is all wrong about it. It is not the object of the committee to secure any special advantage for any special manufacturer, but just to the contrary—to see that all manufacturers of gas stoves shall have an equal chance, that all manufacturers of gas burners shall have an equal show, and a proper space alloted to them in order that they may have an opportunity to show how much better their burner is than that of their neighbors; and the same with gas engines, with retorts, and so on. One of the largest manufacturers in this country, representing probably the largest firm dealing in gas works supplies, told me within two weeks that he did not know what sort of an exhibit to make—that he had not intended to make any—but he said, "whatever your committe ask our firm to do, they will do it. I do not restrict you to any thing. Let your committee advise our firm what they want us to send to Chicago in the interest of the gas industry, and we will send it there at our own expense." That is the way with the representatives of all the large manufacturers in this country. Many of them have said to me personally within the last three months that they will do whatever the committee wish in the way of making an exhibit. The general reply to our application is, "Whatever you ask us to do we will do." I apprehend that every manufacturer will be anxious to do the same thing. But if money is needed I do not think this committee ought to be asked to raise it. I think somebody else ought to do that. There will be work enough for the committee to do in the interest of the industry without putting on them the burden of soliciting funds. I think Mr. Lansden is entirely wrong in what he says. I do not think there will be any difficulty in preventing manufacturers gaining advantage for one speciality over another, but try to guard against any jealousies which might exist between manufacturers of the same kind of appliances. I think that covers the whole thing in a nut shell. The action of this Association should be in a way to assist the committee in the work they have undertaken. I might say further that the electrical exhibit is to be in a building (as perhaps most of the members already know) to be put up specially for their use, nearly 400 feet in length, and more than 150 feet in width. That building has been already designed, and is to be devoted specially to electrical exhibits. What we desire to obtain is a building for an exhibition of gas appliances, or sufficient space in some other building, where the gas industry may be represented in a concentrated form, and not spread out, a part in one building and a part in another, but that all may be in the same building, where any party going in can see before he leaves the building everything that is to be seen in the processes of manufacturing, distributing and using gas.

Mr. Lansden—I want to add that there is no committee from this Association that can hope to satisfy all manufacturers in regard to their exhibit at Chicago. They will be compelled to select, for instance, some one stove, because there will not be space sufficient to exhibit all kinds of stoves; they will have to select some few burners, because they will not have space or opportunity to exhibit one-tenth of the patent burners in the United States. I am opposed to this Association putting itself on record in an official way as having anything to do with the exhibition of gas appliances in Chicago.

Mr. Graeff—A year ago, in St. Louis, the chairman of this World's Fair committee made a statement which I know will satisfy Mr. Lansden. He said he had no doubt that the gas industry would require one-half of the entire space at the disposition of the exhibition committee. Now, if we secure one-half of the entire space Mr. Lansden's objection will be satisfied. I understood Mr. Boardman, a few moments ago, to make a motion to postpone further discussion until this afternoon. If so, I second that motion.

The President—There are really two motions before the Association, and the last is not in order. We will have to dispose of a prior motion first. That motion was to adopt the report of the committee. The other motion is to postpone the whole matter. If you are ready for the question I will put the first motion—which is on the adoption of the report of the committee. Mr. Boardman has made another motion (which will come up if this is adopted) to postpone the discussion. All in favor of the first motion, on the adoption of the report of the committee, will say aye; those opposed, no. The Chair is in doubt.

A standing vote was taken on the motion to adopt the report of the committee, and decided in the negative.

The President—The report is not adopted. Now, Mr. Boardman, you can renew your motion.

Mr. Boardman—I believe that my motion would now be more out of order than it was before. My object was to lay the matter on the table, but as it has now been finally disposed of I have nothing further to say.

The President—I did not understand it in that way.

Mr. Boardman—It was my mistake in not stating that it was my object to lay it on the table until this afternoon. I did not use the technical term.

[To be continued.]

The Atkinson Cycle Gas Engine.

Mr. Henry Warden, who manufactures this engine at his shops, Germantown Junction, Philadelphia, Pa., is greatly encouraged over the results so far gained in the introduction of the motor in this country. The *Iron Age*, in describing the apparatus, which has hitherto been mentioned in the JOURNAL, says:

At the present time our attention is attracted by any device that promises to reduce the cost of producing power, or, to state it with greater accuracy, utilizes a larger percentage of the energy stored in coal. At the present time the gas engine leads, developing an indicated horse power from less than 1½ pounds of coal, results of one test showing 1.11 pounds per indicated horse power per hour, and that, too, in a 12-horse engine developing but 7 or 8-horse power. Clerk, in his work, "The Gas Engine," refers to a pamphlet published by Beau de Rochas, in Paris, in 1862, and we quote: "He states that, to obtain economy with an explosion engine, four conditions are requisite:

"1. The greatest possible cylinder volume, with the least possible cooling surface.

"2. The greatest possible rapidity of expansion.

"3. The greatest possible expansion ; and

"4. The greatest possible pressure at the commencement of the expansion."

In using boiler tubes, he states, the efficiency of the heat transmitted increases with the reduction in the diameter of the tubes. In the case of engine cylinders, therefore, the loss of heat of explosion would be in inverse ratio to the diameter of the cylinders.

Therefore, he reasons, an arrangement which, for a given consumption of gas, gives cylinders of the greatest diameters, will give the best economy or least loss of heat to the cylinder. One cylinder only must be employed in such an engine.

But loss of heat depends also upon time ; cooling, therefore, will be proportionately greater as the working speed is slower.

The sole arrangement capable of combining these conditions, he states, consists in using the largest possible cylinder and reducing the resistance of the gases to a minimum. This leads, he states, to the following series of operations :

"1. Suction during an entire outstroke of the piston.

"2. Compression during the following instroke.

"3. Ignition at the dead point and expansion during the third stroke.

"4. Forcing out of the burned gases from the cylinder on the fourth and last return stroke."

The ignition he proposes to accomplish by the increase of temperature due to compression. This he expects to do by compressing to one-fourth of the original volume.

In designing an engine to meet the conditions laid down above the first may be provided for by careful designing and the second by high piston speed, this being limited by the time necessary for complete combustion. But the difficulty begins with the third, as the greatest possible expansion can only be obtained by expanding the charge to a volume greater than the original volume, for when expanded to the original volume only the charge will have a high terminal pressure, and if expansion is only carried to this point the products of combustion will be discharged with a large amount of energy not utilized. The difficulty also continues with the fourth, as the purer the mixture the higher will be the pressure at the commencement of the expansion, and in an engine in which the four strokes are of equal length it is impossible to obtain a pure mixture, owing to the fact that the necessary compression space is, after the exhaust stroke, left full of the products of combustion, and

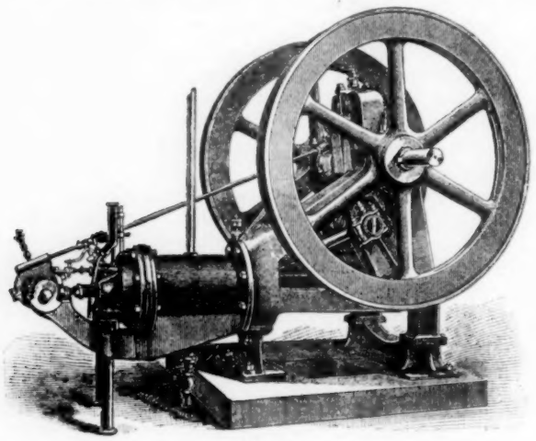


Fig. 1.

these, of course, adulterate the charge and reduce the pressure. There is also another disadvantage attending the use of such a compression space, and that is that it places a limit upon the size of the engine, for if an engine of large power is built the cooling surface of the cylinder will bear such a small ratio to the volume of the cylinder that the percentage of heat lost to the surfaces by the products of combustion during the exhaust, suction and compresston strokes will be very small, and the temperature of the charge will be so high that when the heat due to compression is added a premature explosion will take place and the motion of the engine be retarded or reversed. Consequently to increase the power of engines after certain power has been reached one or more cylinders have been added, forming in reality separate and distinct engines connected to one crank shaft.

The accompanying engravings represent a new engine which, it is claimed, not only overcomes the difficulties presented by the third and fourth conditions, but also the latter trouble—all the operations are performed in one revolution of the crank shaft. Fig. 1 is a perspective view of the engine, and Fig. 2 a sectional elevation showing only the mechanism by which the above operations are effected. It will be noticed that the different operations are obtained by the addition of but two parts —a link which vibrates through the arc of a circle and a connecting rod —and by changing the position of the crank shaft in relation to the cylinder. The outer end of the piston connecting rod is attached to a pin passing through the crank connecting rod, and the latter is connected to the link ; the different centers are so placed in relation to each other and to the center line of the cylinder that the center of the pin to which the piston connecting rod is attached travels in a curve resembling the figure eight, passing over the portion *S E* during the suction stroke,

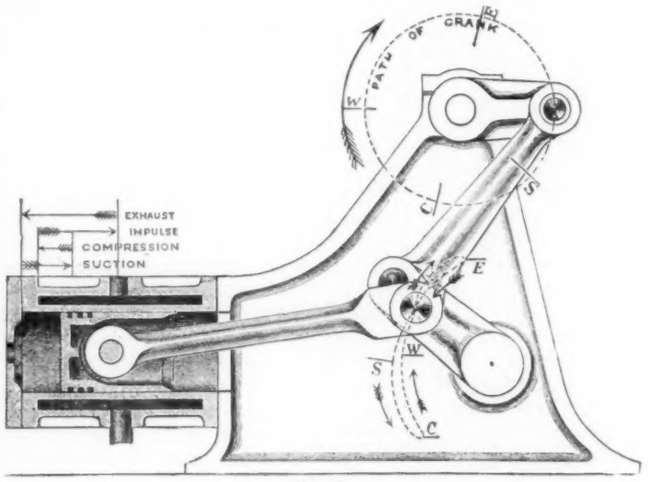


Fig. 2.

over *C W* during the compression stroke, over *W E* during the working stroke and over *E S* during the exhaust stroke. The figure shows that the compression stroke is shorter than the suction stroke, that the working stroke is almost double the suction stroke, that the exhaust stroke ends with the piston as close to the cylinder cover as it is possible mechanically to have it, and that the working stroke takes place in one-quarter of a revolution. It is said that, with a given rotative speed, greater rapidity of expansion can be obtained with this engine than with engines of the Otto type, and that it is possible to expand the charge to such a volume that the terminal pressure will be reduced to the lowest practical point and that, owing to the purity of the charge, the greatest possible pressure will be attained at the commencement of the expansion. Further, that, owing to the fact that practically all the products of combustion are expelled, the incoming charge will attain no higher temperature in a large engine than in a small one and, consequently, large sizes can be built.

Hydraulic Cements.

Mr. Calvin Brown, in the course of a paper read by him some weeks ago before the Technical Society of the Pacific coast, made the following comments :

The two ingredients, carbonate of lime and clay being almost universally used, are found in different forms in the different localities where the article is manufactured. The carbonate of lime in the condition of a very pure and soft chalk is adopted in England where it abounds. On the continent of Europe chalk is also used where it can be obtained, but very many manufacturers there use a hard limestone either in a state of purity or otherwise. The clay, which besides the alumina, also contains the required elements of silica, iron, etc., is found in varying conditions, either as constituting the beds of salt water streams above low water level, or the soil of marshes, or as banks upon high grounds.

In England the mixture of these two ingredients is effected by means of a heavy revolving harrow or stirrer operating in a circular tank, or wash mill as it is termed, wherein is placed the requisite quantity of water and a portion of clay as taken from its natural deposit. Into this wash mill, and after being properly pulverized and sifted, the chalk is introduced in right proportion to the clay. The charge of chalk and clay after a complete reduction of all the particles to an impalpable paste of semi-fluid consistency, is conveyed to large receptacles about 60 by 90 feet in dimensions and 4 feet in depth, and allowed to settle. Charge after charge of the chalk and clay mixture is thus prepared and placed in the receptacle until it is filled, the supernatant water of each layer

being previously drained before a fresh one is added. The entire mass in the receptacle is left to acquire by evaporation a certain solidity, like stiff mud, in order that it may be shoveled into wheelbarrows and conveyed to the drying shed, where it is spread in a layer of a certain thickness upon iron plates laid over flues, through which heat passes from fire places, which frequently are coke ovens, and supply the coke for the final calcination in the kilns. When the mixture or raw cement is sufficiently dried, it is broken in convenient pieces as uniform as possible and charged in layers of about 4 inches thickness into large and lofty kilns; between each layer and below the bottom one is spread a layer of coke of about the same thickness, and when the kiln is fully charged it is fired, the calcination occupying several days. Several days are also required for the cooling of the kiln so that the burnt "clinker," as the cooked cement is called, can be handled and sorted, the properly calcined being separated from the portions that are not so. The selected clinker is then conveyed to the grinding apparatus, ground, and thus converted to powdered cement.

The process just described is termed the wet process, and is exclusively used in England, and possibly to some extent on the Continent, although in the latter country, and especially where hard limestone is employed, the system called the dry process is better adapted to this sort of material. In this system the limestone by grinding is reduced to an impalpable powder, and the clay after being perfectly dried is reduced to the same condition. These two materials are then mixed in the requisite proportion of about 78 per cent. of powdered limestone, when this substance is a pure carbonate, and 22 per cent, of the dry powdered clay, these measures being by weight; they are then introduced to a pug mill with water and incorporated into a stiff plastic paste, which as it leaves the mill is molded into square and hollow prisms or briquettes of a certain size, which after being dried are calcined, as in the wet process, and then ground.

The perfection of Portland cement, primarily, of course, depends on the use of the proper materials and the true chemical proportions of the lime and clay in the mixture. If these conditions are not observed good cement is impossible; their intimate mixture, depending upon the fineness of the particles to which they are reduced and the trituration to which they are subjected, is also an indispensable requisite, and lastly its calcination, which must be carried far enough to produce an incipient vitrification or welding together of these ingredients. The grinding of the "clinker," as the result of the burning is termed from its resemblance to the blackish slag or cinder of an iron furnace or forge, is also important, as the degree of fineness of the ground cement affects its practical economies in several particulars, both as to strength and its capacity for sand, etc.

The operation of burning the raw cement constitutes the most expensive part of the manufacture, besides demanding the most careful attention on the part of the burner. Various forms and systems of kilns have been designed, both of the so-called perpetual and the intermittent sorts, the former being when the fresh charges of raw cement and coke are simultaneously fed to the kiln, as the thoroughly burnt portions are withdrawn, and the latter sort where the charge at once fills the kiln, and is not withdrawn until the whole of it is supposed to be completely calcined. These kilns are of numerous patterns, some of them still used are of fashions employed a century ago for burning quick lime. Into these kilns the raw cement is charged in either lumps or in briquettes, but a late improved system of burning has been introduced into England, wherein the dried raw cement is reduced to small particles and exposed to heat in such a manner that they are quickly converted to the clinker state, thus saving much of the time occupied by the older methods and facilitating with greater economy the operation of grinding. Coke is the usual fuel used in burning. Ordinary coal will not answer the purpose as the sulphur commonly contained in it would combine with the lime of the raw cement and thus tend to the production of a sulphate of lime, and consequently of a cement of too rapid setting. For the production of the clinker an intense heat is necessary, which must be carefully regulated, in order that the calcination may be uniform and without over-burning or under-burning the material, the product in either case resulting in a failure of good cement.

In giving examples of some of the uses of Portland cement Mr. Brown referred to the foundation of the Mare Island dry dock among other structures. In building this, it was found that 17½ cubic feet of stone, 20 cubic feet of gravel, and 200 pounds of Portland cement and the water necessary for moistening the mixture, would exactly make one cubic yard in place after ramming. The solidification by ramming was about 72 per cent. of the original uncompacted mass of the ingredients, and that the proportion of the cement in the solid concrete was about 1 in 13, or 12 of the stone and gravel to 1 of the cement. This concrete as thus prepared and laid in place weighed 144 pounds to the cubic foot, or very near the weight of ordinary well-laid rubble masonry; the stone used in the concrete at Mare Island was very solid and heavy. When there was occasion for removing any portion of the concrete for obtaining a bed for the granite superstructure, it was found to be of admirable strength and hardness, requiring powerful efforts with sharp picks and gads for its displacement. It was absolutely impervious to water. Besides broken stone and instead of it, a heavy mixed coarse and fine river gravel of extra sharpness was used, with the economical result of requiring less cement than the combined broken stone and beach gravel—the quantity of the gravel thus used as the entire matrix was 31.32 cubic feet, and of cement 157 pounds for one cubic yard of concrete in place, or about 1 in 17.

Where masses of concrete are required of considerable depth and are built of successive layers, each layer should have ample time for solid induration before the superincumbent one is added, each layer being kept wet and shielded from a hot sun, as a rapid drying damages the exposed surface by rendering it pulverulent and thus presenting to the succeeding layer an incoherent film, which prevents the bond that ought to exist in the joints between the two, and so throughout the work. To reduce as much as possible, on account of the joints, the number of layers in a deep mass of concrete, and at the same time to effectuate thorough ramming, the thickness of each layer should be regulated to meet those important conditions. It was found at Mare Island that a layer of about 10 inches thickness was most favorable for the effective force of the rammers used on the work—a much thinner layer offering too little resistance for the prevention of a lateral scattering effect of the blow, while in a much thicker layer the force would not act on the lower portions.

As to the use of the water for mixing the concrete, it is to be remembered that the mortar of hydraulic cements is a hydrate, and that its perfect crystallization requires an exact equivalent of its water, any excess being thrown off and any deficiency leaving it devoid of strength from incoherency. Recent investigations in France have shown that the ultimate strength of Portland cement depends greatly upon the proportion of water used in its conglomerates, or when mixed neat. In his own practice in making and testing neat cement, Mr. Brown has used of water from 20 to 33 per cent. by weight, of the loose powder, the smaller quantity giving the best results. In preparing concrete his practice was to add only water enough to a little more than moisten the whole mass, so that in ramming a very slight excess would appear upon the rammed surface. The disadvantages of too much water are several. In the first place in the ramming a jelly-like mass is produced, rendering proper solidification impossible; in the second place, following, of course, the first named effect, the porosity of the mass renders it weak and pervious. These precautions are often overlooked by the ordinary users of Portland cement and conglomerates and in its neat applications; impressed with the erroneous notion that a large quantity of water is needed for a strong cement, and not understanding the principle of its crystallization, they literally drown their mixtures, thus placing them beyond proper solidification and rendering them honeycombed and weak. The entire system of mixing the ingredients of a concrete in the practice of certain operators is highly vicious; a pile of broken stone, perhaps, mixed with gravel or sand, or perhaps the gravel or sand alone, is spread and covered with a quantity of cement, more or less according to the guess of the workman, then turned or shoveled over when dry, and, finally, is deluged with water squirted through a jet-nozzled hose which forces the cement to the bottom of the mass where most of it remains, rendering its equal dissemination impossible by any amount of hand shoveling in the effort of mixing. It ought to be obvious to the slightest consideration of the effect of this torrential treatment that the amount of water should be limited and carefully applied by the gentle action of a rose-nozzle pipe; in this manner a stronger concrete would be produced, and with a less quantity of cement.

Mr. Brown mentioned the importance of exact proportions of the cement ingredients as contained in the lime and clay. Any undue excess, especially in the lime or alumina, causes the existence of an element which may not only be superfluous but detrimental; if there be an excess of clay or alumina added in the mixture the product is likely to be a quick setting cement and deficient in strength. With European engineers one of the tests of Portland cement governing its acceptance for their works is that it must not set within a given number of hours, except in cases where a rapid set is required, as in water currents. It might seem that the initial setting is an indication of the subsequent hardness and strength of the material, the slow process promising best results in these respects. From certain native limestones abounding in clay, Mr. Brown made a natural cement whose powder would instantly be converted to a hard stone when water touched it; placed under water it would remain for several months in this state, but upon being removed would crack and fall to pieces. An excess of lime in Portland cement, or lime uncombined, results in a slacking process of this excess, which, taking effect in work built with the material, causes it to swell or "blow," as it is technically called, showing itself in reticulations upon the exposed surfaces, and sometimes in cracks throughout. The obvious remedy for this excess of lime is to eliminate its causticity by the process of air slacking, which is done by exposing the cement in powder spread in a moderately thin layer to the air for a few days before it is used. It is the manufacturer's duty to see that this aeration is done before the cement is packed for the market, and honest men of this class will not neglect it. Not fully confiding in the integrity of the entire fraternity of makers, it was the practice at the dry dock works at Mare Island to be certain of this aeration by exposing all purchases of cement to the process described.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following respecting certain changes in the management of the Laclede Gas Light Company is from the St. Louis *Post-Dispatch*, of May 30th: "Mr. Emerson McMillin has decided to retire from the Presidency of the Laclede Gas Light Company, and with his resignation may come changes in the Company, one of which has already been determined upon. When McMillin's determination to resign became known a number of rumors were started which were founded on the prospective changes. It was said that the dissatisfaction of stockholders with the consolidation would work a revolution in the Company; that the change of presidents was not the only change which would be made; that Mr. Frederic Egner, the Chief Engineer, had been asked to resign, and a similar request had been sent to Mr. Chollar, the Superintendent of Station A. It was said that an entire disruption of the Company was to follow and a number of new appointments would be made. Mr. James D. Thompson, Vice-President of the Company, said that the rumors had a shadow of truth for their foundation, but only a shadow. 'Mr. McMillin,' he said, 'has never intended to remain here permanently, and since his accident he has concluded that he cannot, for some time, at least, give the affairs of the Company the attention they require, so he concluded to resign, inasmuch as he did not propose to continue as President very long, even if the accident had not occurred.' Did that lead to the request for Mr. Egner's resignation? 'Mr. Egner's resignation was asked for on purely economical grounds. When Mr. McMillin took charge of the Company, being a practical gas engineer, he intended to look after that department himself, but he did not have time to do it. Mr. Egner's resignation was requested, so that when the new President comes in, if he is a practical engineer, he can look after that department and save one salary. That is all there is in it. Mr. Egner is a thoroughly competent gas engineer, and he has been most faithful to the Company. He will remain with us if he chooses to do so as Superintendent.' How about Mr. Chollar? 'The report that he was asked to resign is not true. He is permanently in his position. The reports have all started from a little truth, but they are all exaggerated.' The reports continued to circulate, however, and seemed to increase in number and importance with rapidity. One gentleman who is familiar with the affairs of the Company said: 'This removal of Egner has a more direct cause than a mere shifting of positions. No President of the Company could find the time to do the work of the Chief Engineer. It is a day's work to visit all the plants, and it would be impossible for the President to do it and to attend to the duties of his office at the same time. Mr. Egner has had certain opposition in the Company for a long time, but what led directly, I am informed, to his removal, was a paper read by him before the Western Gas Association. In this paper he discussed the advisability of gas companies buying out rival electric light companies, and spoke of the folly of a gas company absorbing an electric light company that was burdened with debt. This, of course, was a direct hit at the St. Louis Company, or could be interpreted as such, since it fit the case of the Laclede Company exactly. That paper was read May 20th, and between the time it was delivered and now, Mr. Egner's resignation was asked for and handed in, to take effect on June 1st. There has been more than one effort to get him out, and the paper furnished the occasion. The truth is, that the stockholders are dissatisfied because this Company has not come up to their expectations. Its stock and bonds amount to $20,000,000. Of the stock, $7,500,000 is common, and $2,500,000 is preferred. One or two dividends on the preferred stock have been passed, and the stockholders are displeased. The 5 per cent. interest on the bonds and the 5 per cent. dividends they expected to pay on the stock make a total of $1,000,000, which the Company is called upon to earn annually, and that is a heavy load to carry. Mr. McMillin is on crutches in Columbus, and while he is in that condition I do not suppose he wants the worry of managing such a Company on his shoulders, so he concluded to resign; but I think there will be some interesting developments before the Company settles all its new officers in their positions and resumes its quiet method of doing business.'"

THE Committee on Gas of the Common Council of Fort Wayne, Ind., have made a report on the proposed public lighting contract in that city, the same to cover a period of either 3 or 5 years from July 1st. When the matter has been finally arranged we will publish the figures.

WE are called upon to announce the death, at Taunton, Mass., on May 28th, of Mrs. Olive Leach, the mother of Mr. Henry B. Leach, of the Taunton Gas Light Company. Mrs. Leach was in her 96th year, and her life was very closely intertwined with that of her son with whom she had resided since the death of her husband, in 1857. She was universally beloved in Taunton, where all her harmonious life was spent. The funeral services were held at the residence of Mr. Henry B. Leach, on the afternoon of Sunday, May 31st.

THE Compania Nacional de Foejas y Estaleiros, of Rio Janeiro, Brazil, has placed the order for a large iron building, to be used in connection with its shipbuilding plant, with the Berlin Iron Bridge Company, of East Berlin, Conn., and the order for the machinery with J. A. Fay & Co., of Cincinnati, O. The building, which is to be entirely of iron, is to be 165 feet in width by 300 feet in length, and will be shipped by steamer from this country, the various parts being carefully marked, so that the same can be put in place by native workmen at Rio de Janeiro. The Berlin Iron Bridge Company is doing a large trade with the South American Republics, which goes to show that our commercial relations with our cousins are constantly becoming closer.

The meeting of the Presidents of the Brooklyn Gas Companies, to determine whether the gas bills for May should be made out on the basis of $1.25 instead of $1.50 per 1,000 cubic feet, was held on June 1st, at the office of the Fulton-Municipal Company. General Jourdan, of the Fulton-Municipal, held out for the $1.50 rate, but eventually gave in to the views of those who advocated the lower figure, owing to the force of circumstances. President Morgan, of the Nassau Company, was outspoken in advocating the *de facto* instead of the *de jure* rate. The following particulars respecting the meeting and the conclusions thereat, are from the Brooklyn *Daily Eagle*, of June 1st:

"* * * At the conclusion of the meeting—which was quite a long one—the Presidents notified the Secretaries of the different companies to send out the May bills at the rate of $1.25 per 1,000. These bills had been held back until this meeting decided the rate. Before the meeting it was almost a foregone conclusion that this action would be taken. This did not prevent General Jourdan and the other Presidents who favored continuing the price of gas at the present rate from attempting to turn the minds of Mr. H. P. Morgan and of the other Presidents who favored the temporary reduction. Argument, however, was of no use. No change of mind could be effected. Those who were beaten took their defeat gracefully and nothing marred the harmony of the meeting. It is not proposed, however, to keep the price at $1.25 any longer than necessary. In the first place, the rate will have to be decided by the courts, who will be asked to declare whether $1.50—the undoubted intent of the Legislature—or $1.25, the accident of the codification measure is the legal price in this city. If $1.50 is declared legal the consumers who have paid only $1.25 will be asked to reimburse the companies for the extra 25 cents per 1,000 given them by to-day's action. This suit will be begun at once. General Jourdan and United States District Attorney Johnson held a long conference late this afternoon on the matter. This is not the only suit that will be brought, for the Fulton-Municipal Gas Company has announced its intention of testing the constitutionality of the Legislature fixing the price of gas at all. They have determined to carry the suit, if necessary, to the Supreme Court of the United States. This suit will also be brought soon, but it is not of the same immediate importance as the first case. In that event the companies will combine to pay the legal expenses. In the constitutional case no such arrangement has been made, and if necessary General Jourdan's Company will bear all the expense. The claim is that the Legislature has no more reason or right to fix the price of gas, which is a manufactured product, than it has the price of bread, of tools, of clothes, or of electric lights. Electric lighting occupies the same position before the public as gas, yet no attempt has ever been made to limit its price, and because of a combine in the competition in this city the public pays $182.50 per lamp. General Jourdan was seen by an *Eagle* reporter this afternoon. He was very busy and could only submit to a very brief interview. 'The meeting was harmonious,' he said. 'We were forced to come to the decision that we finally arrived at because of the position taken by Mr. Morgan and one or two other Companies. I am unable to say how or when the suits will be brought until I have consulted Mr. Johnson.' He refused to say what he thought of the action taken, or to give his opinion of its effect upon consolidation. It was learned from other sources that a plan for combination is now being formulated, and as soon as litigation establishes the price of gas it will be submitted to the stockholders of the different Companies. The gentleman who told the reporter this said: 'While these meetings have been quiet and courteous, a feeling has been engendered that may have a very important effect upon the gas business. Two factions have been formed. This, with the objections of the Presidents of the smaller Companies to consolidation, may cause the formation of two powerful, wealthy, and rival combinations. This, of course, means a gas war. Of course I only speak of this as a possibility and not as a probability.'"

Among the missing ones at the last meeting of the Western Gas Association was Mr. E. M. Russell, of St. Louis, whose absence, having been noted, aroused inquiry as to the cause. The reply was that a temporary sickness prevented him from putting in an appearance; but in the last week in May the symptoms took a dangerous form, and on the 28th ult. he succumbed. Deceased, who was in his 25th year, was a cousin of Vice-President Russell of the Parker-Russell Mining and Manufacturing Company, of St. Louis, and was also in the employ of that Company. His death, so unexpected and at such an early age, is greatly to be deplored, for he was in every sense a gentleman. He was an Associate Member of the Western Gas Association.

The Chicago offices of the Maryland Meter and Manufacturing Company, are now at 122 and 124 Michigan street, that city. The Company, we are glad to say, prospers exceedingly, the growth of its business being pretty well attested by the fact that it has had to increase its manufacturing facilities fully 50 per cent. over those found equal to its needs of a short time ago.

At the annual meeting of the Kansas City (Mo.) Gas Light and Coke Company the following officers were chosen: Board of Directors, M. J. Payne, E. L. Martin, John A. McDonald, W. W. Gibbs, and Samuel T. Bodine; President, M. J. Payne; Secretary, Walter Woolcott; Engineer, George H. Harper; Superintendent, George S. Clarke. The Secretary's annual report was notable for a lengthy reference to the use of gas for fuel, the figures going to show that the day send-out in Kansas City has made a tremendous gain.

At the annual meeting of the village of Penn Yan, N. Y., the voters indorsed the recommendation of the Board of Trustees to expend $3,900 for the lighting of the streets during the current year.

In our issue for March 9, last, we noted that Robert Hogan had instituted suit against the Troy (N.Y.) Gas Company, for damages to property and person because of an escape of gas upon his premises. Hogan seems, however, to have had poor cause for action, in that the suit was recently withdrawn.

The officers of the Troy (N. Y.) Gas Company are: President, Edward Murphy, Jr.; Vice President, William Kemp; Treasurer, Derick Lane; Secretary, C. E. Davenport.

The proprietors of the Danville (Ills.) Gas, Electric Light and Street Car Company have arranged to expend $30,000 on improving their properties. The betterments include new purifiers and the placing of an incandescent dynamo rated to maintain 1,000 lamps, of 16-candle power each.

Vallejo (Cal.) has contracted with local parties to furnish 40 arc lamps, of 2,000-candle power each, on account of public lighting.

At a recent meeting of the Plainfield (N. J.) Common Council a communication was received from Roderick Robinson and Frank A. Harrison, asking for a franchise to establish a gas works in that city. They agree to furnish gas for illuminating purposes at the outset at $1.50 per 1,000 cubic feet, reducing the rate to $1.30 per 1,000 as soon as the daily consumption amounted to 150,000 cubic feet, and to $1.25 per 1,000 when the daily output equalled 200,000 cubic feet. The McKenzie process is to be used. The communication was referred to the Committee on Public Lights.

Recent Baltimore advices are to the effect that the Mayor has signed the resolution authorizing the city to contract for the maintenance on the streets of 35 Siemens-Lungren-Gordon high power gas lamps, at a cost not to exceed 25 cents per lamp per night. The correspondent who forwards the information also incloses the following from the Baltimore *American:* "The lamps are to be placed on Madison avenue, from Biddle street to North avenue, one at each corner and one in the center of each block. The price named ($91.25 a year for each lamp, or $3,193.75 for the entire number) includes the gas, use of lantern, and lighting and extinguishing. While the new burners give a better light than the ones now in use, it is an open question if the difference in illuminating power is anywhere near the difference in cost. Besides, it establishes a principle of which the Mayor has been fighting shy in regard to the paving cases, on the ground that what one street receives every street or alley in the city where taxes are paid has the right to demand. Therefore, the Company and residents might want this costly lamp everywhere. Councilman Supplee, who introduced the resolution, says he received it from ex-Judge William A. Fisher, who stated that the people on the avenue wanted the lamps. The question was raised if it would not be better to buy the lanterns outright, as it may be cheaper, especially if the lamps be continued in use. The lanterns cost $33 each, while the others now in use cost $3, and while they burn on an average about 4,200 cubic feet of gas a month, in value amounting to about $62 a year (three times as much as the others), it is thought that there would be a saving rather than to pay 25 cents a night for an indefinite term. The electric light and gas appropriation was cut down by the Council, and the additional cost, which is not provided for in the levy, may help to swell a floating debt."

In the meantime, while straining at the gas light gnat, as put forth in the above instance, our correspondent remarks that the authorities have no particular trouble in swallowing whole the camel afforded in the electric lighting of the city. In respect to this he says: "The City Council Committee on Ways and Means has (up to May 27th) taken no action on the resolution to purchase apparatus for the measurement of the candle power of the electric lights furnished to the city, which Councilman Bland says he has been informed by the officials having charge of the matter at times do not reach 1,000 candles, although the ordinance calls for 2,000-candle power light. The apparatus for the measurement of the candle power is said to be reliable, and such being the case, it is difficult to see how the city authorities can refuse to purchase apparatus destined to prove that the city gets what it pays for. In all branches of trade articles purchased are proven to be of full weight, measurement, and of the quality paid for before accepted. When purchasing coal, for instance, the city officials in charge look after the weight, although buying from reliable persons. There is no reason why the resolution should not be adopted; and there is no good reason why the tests should not be carried out after the apparatus is purchased."

In a circular recently issued to the shareholders of the Standard Gas Light Company, of this city, we find it stated that President Andrews, at the last annual meeting asserted that statistics proved that the growth of gas consumption in New York city, for 40 years prior to the introduction of electricity for lighting purposes, averaged about 10 per cent. per annum. That is, the gas output doubled every 10 years, and that the city had doubled in population every 17 years. Since the first introduction of the electric light, however, the increase in New York of the consumption of gas has been much more rapid. It almost immediately jumped up to 12 per cent. per annum, and in 1887 showed a growth equal to about 14 per cent. per annum, a ratio of growth that was still further exceeded in the years 1888–89–90. In fact he was willing to stand by the statement that the gas output of New York was doubling itself now in a period of 6½ years, instead of 10 years, as before. He thought one reason for this very rapid increase was due to the fact that the electric light had educated the human eye "in the aggregate" for a demand for more light, and that people are not at all satisfied with the volume of light that formerly satisfied them. Again, a more luxurious mode of living is constantly prevailing in the city, as in all great cities, which is shown in the great increase in the use of gas for cooking and heating purposes. In conclusion, President Andrews thought it was safe to say that at no time in the history of the gas industry, from its beginning in this country some 60 odd years ago to the present time, has the outlook been more promising. Indeed, at no time has it been so inviting for the investment of capital as at present, and it may be stated as a settled fact that the electric light, at least in New York city, is not at all a competitor with gas to the injury of the latter.

Advices from Saratoga Springs, dated May 29th, say that three years ago Wm. Foster, Jr., and R. H. Hazzard bought for $160,000 the plants and business contracts of the Saratoga Gas Company and the Saratoga Electric Light Company. They consolidated the two companies into the Saratoga Gas and Electric Light Company and issued thereon $325,000 in stock and $300,000 in bonds, agreeing to divide the profits. Foster received his share and Hazzard, alleging that $57,000 of the bonds were wrongfully converted, commenced suit in the name of the Company for that amount. A verdict was rendered for the defendant.

H. O. Newcomb, City Solicitor, will receive bids for lighting the streets of Millville, N. J., by means of arc lamps, up to noon of June 10th.

During 1890, according to the returns of the Massachusetts Insurance Department, one fire was reported as having occured at a gas works in that State, and the amount paid in the shape of recompense for damages to buildings and contents was $500. On the other hand, 7 fires are reported as having occurred in electric lighting stations, and the insurance paid over on account of damages to buildings and contents is returned at $18,885.

The Legislature of Texas has set apart $3,000 for the purpose of defraying the expenses of testing thoroughly whether or not the lignite coals of that State can be made to coke satisfactorily.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

MONDAY, JUNE 8, 1891.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

June 8.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	95¾	96½
Central	500,000	50	—	90
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	119	120
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	118	120
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	48
Preferred	5,000,000	100	—	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	100	102
Citizens	1,200,000	20	88	90
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	—	130
" Bonds	300,000		100	105
Peoples	1,000,000	10	—	91
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	100	103
" Bonds (5's)	70,000	—	—	—
Nassau	1,000,000	25	136	—
" Ctfs	700,000	1000	100	102
Williamsburgh	1,000,000	50	127	—
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	87	—
2d " " "	3,000,000	1000	—	74
Bay State Gas Co.—				
Stock	5,000,000	50	58	60
Income Bonds	2,000,000	1000	95½	—
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	52⅝	52¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	100	90	91½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	—	100½
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	6,500,000	100	207	209
Consumers Toronto	1,000,000	50	169	172
Central, S. F., Cal			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	—	45
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	109	114
Jersey City	750,000	20	165	170
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	—	15¾
Preferred "	2,500,000	100	30	50
Bonds	9,034,400	1000	73	74½
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds.	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			34¾	35½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	63	63½
Washington, D. C	2,000,000	20	200	208
Wilmington, Del.		50	88	90

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City 833
Wm. Henry White, New York City 839
Fred. Bredel, New York City 835
Jas. R. Smedberg, Peoria, Ills 833

CHEMISTS.

Durand Woodman, New York City 833

GAS AND WATER PIPES.

Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) 853
Ohio Pipe Co., Columbus, Ohio 833
M. J. Drummond, New York City 833
R. D. Wood & Co., Phila., Pa 838
Warren Foundry & Machine Co., New York City 833
Donaldson Iron Co., Emaus, Pa 833
Addyston Pipe and Steel Co, Cincinnati, O. 833

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills 830
Bartlett, Hayward & Co., Baltimore, Md 837
United Gas Improvement Co, Phila, Pa 829
Burdett Loomis, Hartford, Conn 826
American Gas, Light and Heat Co., Phila, Pa 836

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City 839
Continental Iron Works, Brooklyn, N. Y 839
Deily & Fowler, Phila., Pa 839
Kerr Murray Mfg. Co., Fort Wayne, Ind 836
Stacey Mfg. Co, Cincinnati, Ohio 839
Bartlett, Hayward & Co, Baltimore, Md 837
Morris, Tasker & Co., Limited, Phila, Pa 837
Davis & Farnum Mfg. Co., Waltham, Mass 836
R. D. Wood & Co., Phila, Pa 838
Bouton Foundry Co., Chicago, Ills 839
Isbell-Porter Company, New York City 838
Fred. Bredel, New York City 835
United Gas Improvement Co., Phila., Pa 829
National Gas Light and Fuel Co., Chicago, Ills 830
Berlin Iron Bridge Company, East Berlin, Conn 826

INCLINED RETORTS.

Laclede Fire Brick Mfg. Co., St. Louis, Mo 787
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 834

GASHOLDER TANKS.

W. C. Whyte, New York City 830
J. P. Whittier, Brooklyn, N. Y 831

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass 826

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J 834
B. Kreischer & Sons, New York City 834
Adam Weber, New York City 834
Laclede Fire Brick Mfg. Co., St. Louis, Mo 834
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y 834
Borgner & O'Brien, Phila., Pa 834
James Gardner, Jr., Pittsburgh, Pa 834
Henry Maurer & Son, New York City 835
Chicago Retort and Fire Brick Co., Chicago, Ills 834
Baltimore Retort and Fire Brick Co., Baltimore, Md 834
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 834
Boston Fire Brick Works, Boston, Mass 834

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City 790
R. D. Wood & Co., Phila., Pa 838
James R. Floyd & Sons, New York City 832
Continental Iron Works, Brooklyn, N. Y 839

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md 837
Fred. Bredel, New York City 835
Chicago Retort and Fire Brick Co., Chicago, Ills 834
J. H. Gautier & Co., Jersey City, N. J 835
Adam Weber, New York City 824
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 834

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 831
Fred. Bredel, N. Y. City 835
Wilbraham Bros., Phila., Pa 831

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City 838
Continental Iron Works, Brooklyn, N. Y 825

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City 826

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y 834

GAS METERS.

John J. Griffin & Co., Phila., Pa 842
American Meter Co., New York and Philadelphia 843
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa 843
Helme & McIlhenny, Phila, Pa 843
D. McDonald & Co., Albany, N. Y 843
Nathaniel Tufts, Boston, Mass 842
Maryland Meter and Manufacturing Co., Baltimore, Md 842
Harris Bros. & Co., Philadelphia, Pa 842

METER DIALS.

Caesar Bros., New York City 840

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind 828
Isbell-Porter Company, New York City 838
Wilbraham Bros., Philadelphia, Pa 831
Connelly Iron Sponge and Governor Co., New York City 831

GAS COALS.

Penn Gas Coal Co., Phila., Pa 841
Perkins & Co., New York City 840
Despard Coal Coal, Baltimore, Md 841
Chesapeake and Ohio R. R. Coal Agency, N. Y. City 841
Westmoreland Coal Company, Phila., Pa 841
J. & W. Wood, New York City 840

CANNEL COALS.

Perkins & Co., New York City 840
J. & W. Wood, New York City 840

ANTHRACITE COALS.

Coxe Bros. & Co., New York City 841

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio 841

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y 823
Chapman Valve Manufacturing Co., Boston, Mass 823
R. D. Wood & Co., Phila, Pa 838
The P. H. & F. M. Roots Co., Connersville, Ind 828
Continental Iron Works, Brooklyn, N. Y 839

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa 808
Clerk Gas Engine Co., Phila., Pa 841

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass 831
Westinghouse Machine Co., Pittsburgh, Pa 833

GAS LAMPS.

Fiske, Coleman & Company, Boston, Mass. 834

PURIFIER SCREENS.

John Cabot, New York City 823

GAS STOVES.

American Meter Co., New York and Philadelphia 827
The Goodwin Gas Stove and Meter Co., Phila., Pa 814
George M. Clark & Co., Chicago, Ills 824
Maryland Meter and Manufacturing Co., Baltimore, Md 842
Dangler Stove and Mfg. Co., Cleveland, O 825

BURNERS.

C. A. Gefrorer, Phila., Pa 841
Moses G. Wilder, Phila., Pa 824
H. W. Rappleye, Phila., Pa 824

STREET LAMPS.

J. G. Miner, Morrisania, New York City 823
Bartlett Street Lamp Mfg. Co., New York City 823

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City 824

PURIFYING MATERIAL.

Connelly Iron Sponge and Governor Co., New York City ... 831
Greenpoint Chemical Works, Brooklyn, N. Y. 831

COKE CRUSHER.

C. M. Keller, Columbus, Ind. 823

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City 839
Fort Wayne Electric Co., Fort Wayne, Ind 832

BOOKS, ETC.

1890. Directory. 1850 831
King's Treatise 725
Electric Light Primer 841
American Gas Engineer and Superintendents' Handbook ... 835
Digest of Gas Law 823
Fuel and its Applications 823
Newbigging's Handbook 835

WANTED,

A Nine-Foot Station Meter, Second Hand,

In good repair, with Index and Gauges complete. Address

835-3 "J. T. L.," care this Journal.

Position Wanted

As Superintendent of a Small Gas Works

By a young man experienced in the manufacture and distribution of Coal and Water Gas; also in fitting in all its branches. Water Gas preferred. Address

831-tf "E. M.," care this Journal.

POSITION DESIRED

As Superintendent of Gas Works,

By a young man fully experienced in the details of construction, manufacture, and distribution. Best of references. Address

814-tf "CONSTRUCTION," care this Journal.

FOR SALE,

One Air Condenser, 500,000 feet capacity.
One Multitubular Condenser, 500,000 feet capacity.
One Anderson Tar Extractor, 500,000 feet capacity.
Ten 12-inch Chapman Valves.
One Station Meter (Tufts'), 40,000 feet capacity.
Seventy-Five 12-inch by 20-inch Mouthpieces, with Balmore's Self-Sealing Lids.

All in good order. Address NEW HAVEN GAS LT. CO.,

819-tf New Haven, Conn.

STEATITE

In pieces and cleaned for

Gas Burner Manufacturers

Apply to

KARL SCHMIDT, Lichtenfels, Bavaria.

Proposals for Street Lighting.

SEALED BIDS will be received at this office up to 12 o'clock, M., June 15, 1891, for the furnishing, lighting cleaning, repairing and keeping in repair, seven hundred or more gas, gasoline or electric lamps or lights, for the term of two years. Said lamps or lights to be of the latest design, frames and fixtures to be painted, and when damaged in any way to be repaired at once. The glass to be kept clean and bright at all times, lamps or electric lights to be lighted at sunset and kept constantly burning until daylight every night in the year. The right is reserved to order the relocation of lamps or electric lights from time to time as the city gas inspector may direct. Bidders will be required to exhibit to the gas committee of the city council three days prior to the opening of bids samples of lamps, posts and burners they propose to furnish. All bids must be accompanied by a certified check of five hundred dollars, and the successful bidder will be required to give a bond in the sum of five thousand dollars for the faithful performance of the contract.

The right is reserved to reject any or all bids.

C. S. GOODRICH,
City Comptroller.

May 27, 1891.

Bartlett Street Lamp Mfg. Co.

MANUFACTURERS OF

Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

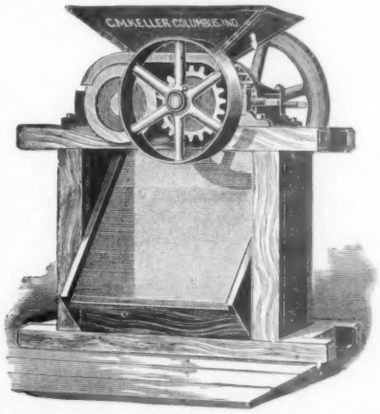
LAMP POSTS

A Specialty.

Office and Salesroom,

40 & 42 COLLEGE PLACE, - - N. Y. CITY.

Gas Companies and others intending to erect Lamps and Posts will do well to communicate with us.



Keller's Adjustable Coke Crusher

SIMPLE, STRONG, AND DURABLE.

J. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.

CHAPMAN VALVE MANUFACTURING CO.,

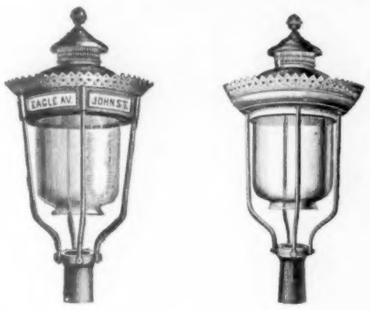
MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants With and Without Independent Nozzle Valve. All Work Guaranteed.

WORKS & GEN'L OFFICE:
Indian Orchard, Mass.

TREASURER'S OFFICE:
72 Kilby & 112 Milk Sts, Boston, Mass.



The Miner Street Lamps.

Jacob G. Miner,

No. 823 Eagle Ave., New York, N. Y.

Special Trays for Iron Sponge or Oxide of Iron.

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable. Most Easily Repaired.

306-310 Eleventh Avenue, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

LUDLOW VALVE MFG. CO.

OFFICE AND WORKS,

938 to 954 River Street and 67 to 83 Vail Av., TROY, N. Y.

Hydraulic Main Lap Regulators, also Check Valves, Foot Valves, Yard-wash and Fire Hydrants.

Send for Circulars.

Valves.—Double and Single Gate, ¼ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil. Send for Circulars.

MANHATTAN FIRE BRICK AND ENAMELED CLAY RETORT WORKS.

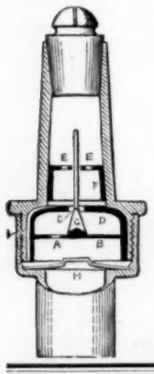
ADAM WEBER, Prop'r,

633 East Fifteenth St., N. Y.

Modern Recuperative Furnaces

FOR FIRING COAL GAS AND FIXING BENCHES, ALSO INCLINED AND VERTICAL RETORTS.

The most successful Furnace in America in competition with all others. Results equalled by no other Furnace. Full or Semi-Regenerative. Superior to all others in strength of construction and prolonged life of Retorts and Furnace.



Rappleye's Rheometric Governor Burner.

Free Sample and Special Price to Gas Light Companies.

WILMINGTON COAL GAS COMPANY,
WILMINGTON, DEL., March 26, 1889.

H. W. RAPPLEYE, ESQ.: Dear Sir—Yours of 19th inst. received. In reply will say that our Company has used your Rheometric Governor Gas Burners since January, 1886, and find them to be a first-class burner for our public lamps.

Very truly,
THOMAS CURLEY, Supt.

H. W. RAPPLEYE, 2814 Poplar St., Phila., Pa.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER.

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

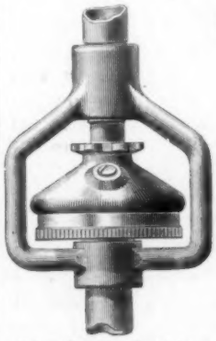
H. E. PARSON, Supt., No. 54 Pine St., N. Y

MOSES G. WILDER, MECH. ENGR.

816-18-20-22 Cherry St., Phila., Pa.

Volumetric Lamp Governors

FOR GAS LAMPS & HIGH-POWER BURNERS.



GOVERNOR BURNERS
for
STREET LAMPS AND GENERAL USE,
and
GOVERNORS FOR ARGAND AND OTHER COMMON GAS BURNERS IN ALL SIZES.

HORIZONTAL
Governors
Specially adapted for
GAS STOVES, FURNACES, Etc., Etc.

It is well known that a large majority of all High Power Gas Lamps in the United States have my Governors attached, and they are always used by the leading makers of these lamps. To remove any excuse for the use by anyone of inferior and infringing Governors, a reduction in price has been made, and all exclusive contracts are cancelled.

Correspondence Solicited with all who require a Reliable Governor.

JEWEL GAS STOVES

MANUFACTURED BY

GEORGE M. CLARK & COMPANY,

157 & 159 Superior Street, - Chicago, Ill.

EVERY CONCEIVABLE SIZE AND STYLE.

Ranging in Prices from $1.50 to $37.00.

WE USE NO GAS COCKS.

All Flames are Regulated by a Direct Needle Valve.

The JEWEL

IS THE

Only Well-Made Gas Stove on the Market.

Write for our 1890 Catalogue and see for yourself.

Jewel Circulating Water Heater. $15.00.

SELF-SEALING RETORT MOUTHPIECE AND LID.

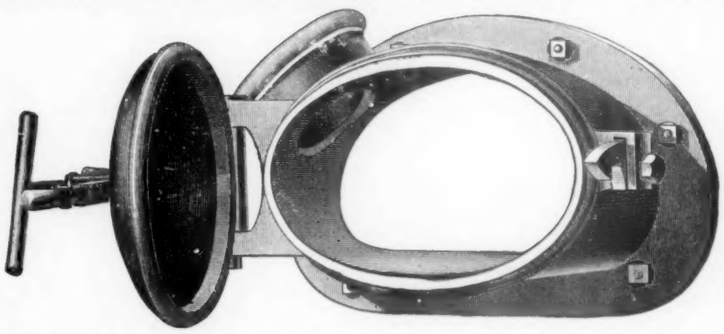
MANUFACTURED SOLELY BY

The Continental Iron Works

THOS. F. ROWLAND, President.

Take 10th or 23d Street Ferries from New York to Greenpoint. **BROOKLYN, N. Y.**

Made for Round, Oval, or "D" Retorts.



Joint made under the well-known Balmore Patent

This Mouthpiece and Lid was introduced to the public in 1884, and since then large numbers have been manufactured and sold.

The following important Gas Companies have them in use at the present time, to any of which we refer:

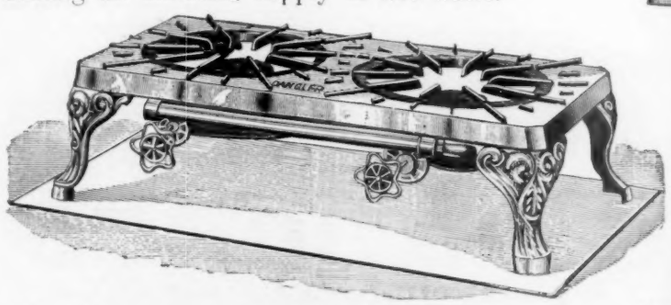
Charleston (S. C.) Gas Light Company.
Williamsburgh (Brooklyn, N. Y.) Gas Light Co.
Bridgeport (Conn.) Gas Light Company.
Buffalo Mutual Gas Light Company.
Palatka (Fla.) Gas Light Company.
Gainesville (Fla.) Gas Light Company.
Syracuse Gas Light Company.
Taunton (Mass.) Gas Light Company.
Providence Gas Light Company
Central (New York City) Gas Light Company.
Northern (New York City) Gas Light Company.
Stamford (Conn.) Gas Light Company.
Holyoke (Mass.) Gas Light Company.
Springfield (Mass.) Gas Light Company.

THE DANGLER GAS RANGES AND STOVES.

In calling the attention of those interested to our perfect working GAS STOVES AND RANGES, after a thorough and rigid trial of years, we have the unqualified assurance from the heads of over 6,000 households that our GAS RANGES AND STOVES are a perfect success for baking, cooking, broiling and roasting, and our

HOT WATER DEVICE

is a marvel of convenience and economy, furnishing an unfailing supply of hot water.



Our line includes all the different styles of Ranges and Stoves, and we call special attention to our

Hot Plates,

which are especially popular on account of the size and style, and finished either in nickel or polished iron.

We invite correspondence and send Catalogues on application.

New York Show Rooms, 40 & 42 College Place. **THE DANGLER STOVE AND MFG. CO., Cleveland, O.** THOS. HOLT, 111 & 113 N. 2d St., Phila.

The American Gas, Light & Heat Co.,

OF

249 S. 6th St., Phila., Pa.,

Are now prepared to erect plants of their Oxy-Hydrocarbon Process, to carburet coal gas up to any given or named candle power required for general consumption (for instance, from 20 to 25 candles), and at a cost not to exceed one and three-quarters (1¾) cents per candle power per 1,000 cubic feet increased, with a permanent and perfectly *fixed* gas, *not a vapor*—a gas that will whiten the whole output of the works.

This gas can be furnished at a cost less per 1,000 cubic feet than the coal gas may be costing the company.

Our system is such that we can furnish plants that will carburet 50,000 cubic feet in 24 hours, or three or four million feet in the same length of time. *One* of our large benches or plants would be capable of generating 100,000 cubic feet of gas in 24 hours, which would raise the candle power on 2,000,000 feet (taking as a standard coal gas at 15 candles) 3 candles on the 2,000,000 feet, enabling the works to deliver to consumers an 18 candle gas; or, enlarging our plant, the candle power may be increased as desired, at the same cost per candle power, less interest on plant.

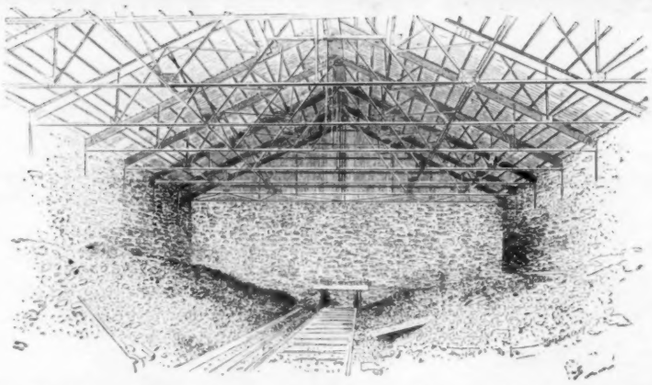
This is much less per candle power than it can be furnished by the use of cannel coal or by vaporizing naphtha. With our process we improve the whole output in color—viz., whiten the flame with the oxygen, as well as furnishing a *thoroughly fixed* gas, and no possible danger of separation as there is with vapor. Correspondence solicited.

J. J. NEWELL, Sec'y.

September 4, 1890.

THE BERLIN IRON BRIDGE CO.

Write for Illustrated Catalogue.



Write for Illustrated Catalogue.

The above illustration shows an interior view of an iron roof built by us for the Isabella Furnace, at Barneston, Pa., for their Stock House. The building is 55 feet in width by 101 feet in length, with stone walls and iron roof, thus making a construction which is absolutely fireproof. For Casting Houses, Foundries, Forge Shops and that class of buildings this construction particularly commends itself.

Office and Works, EAST BERLIN, CONN.

Agencies: (S. W. BOWLES, JR., Western Mangr., 556 Rookery Building, Chicago, Ill
M. B. CRANT, Enterprise, Miss. WM. PAYSON, San Antonio, Texas.
W. E. STEARNS, - - - 318 Odd Fellows Building, St. Louis, Mo.

GASHOLDER PAINT.

Use Only

THE GOVERNMENT WATERPROOF PAINT.

Proof against Ammonia, and Absolutely Waterproof. Send for Prices and Particulars.

THE GOVERNMENT WATERPROOF PAINT CO., 122 Milk Street, Boston, Mass.

THE WALKER TAR AND CARBONIC ACID EXTRACTOR.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the Tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, six years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. Several have been erected in the United States.

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus, and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers.

"C. A. GERDENIER, Supt. Bridgeport (Conn.) Gas Lt. Co."

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results guaranteed in every instance.

GEO. SHEPARD PAGE, Sole Agt. for the U. S., 69 Wall Street, N. Y. City.

Water Gas! Fuel Gas!

For all Manufacturing Purposes. Generated from Bituminous Slack, Anthracite Coal Dust, or Coke Breeze, by

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Sons' Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Utilizing any Kind of Low-Priced Coals.

NOVEL IN DESIGN, MODERN IN CONSTRUCTION, SIMPLE IN OPERATION, PERFECT IN RESULTS.

Plans and Estimates Furnished.

BURDETT LOOMIS, - - Hartford, Conn.,

Or Murray Hill Hotel. New York City.

GAS STOVES. GAS METERS. GAS STOVES.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

MANUFACTURERS OF

Standard 3 Diaphragm Dry Meter.

Gas Meters,

STATION METERS,

METER PROVERS, PHOTOMETERS,

Experimental Meters of all Kinds,

AND

Standard 2 Diaphragm Dry Meter.

Apparatus for Testing the Quantity and Quality of Gases.

Meters for Measuring Natural Gas.

MANUFACTORIES,

508 to 514 West Twenty-second St., N. Y. Arch and Twenty-second St., Phila.

Nos. 244 & 246 North Wells Street, Chicago, Ill.

AGENCIES,

No. 177 Elm Street, Cincinnati, Ohio. No. 222 Sutter Street, San Francisco, Cal.

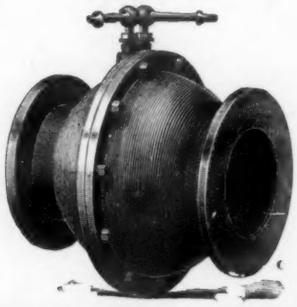
No. 810 North Second Street, St. Louis, Mo.

GAS STOVE SHOW ROOMS, No. 242 Sixth Avenue, New York City.

ROOTS'
GAS AND BYE-PASS VALVES.

GAS VALVE

Quick Acting,
Simple,
Efficient, Durable.

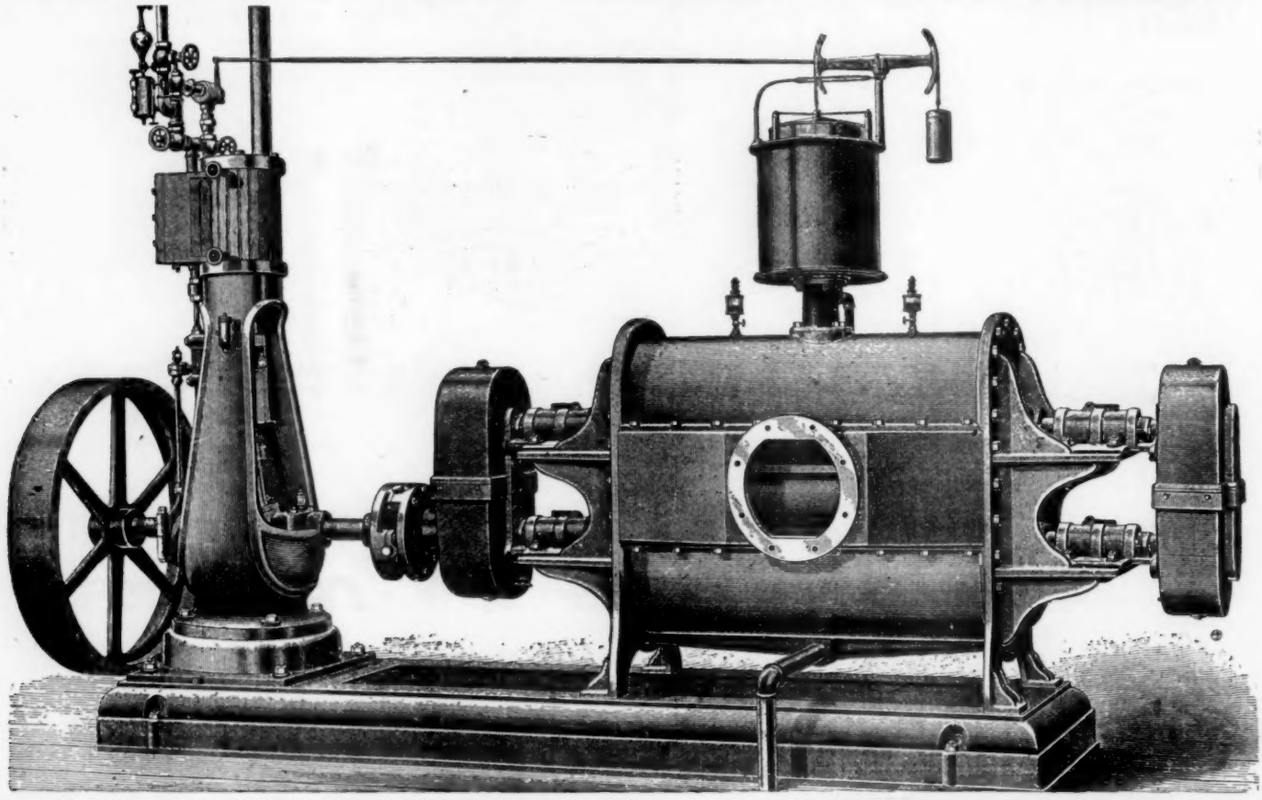


BYE-PASS VALVE.

Automatic Action
Reliable
Simple Durable.

Thousands now in use and giving perfect satisfaction. Write for Catalogue and Prices.

ROOTS'
NEW GAS EXHAUSTER.



THE P. H. & F. M. ROOTS CO., - - CONNERSVILLE, IND.

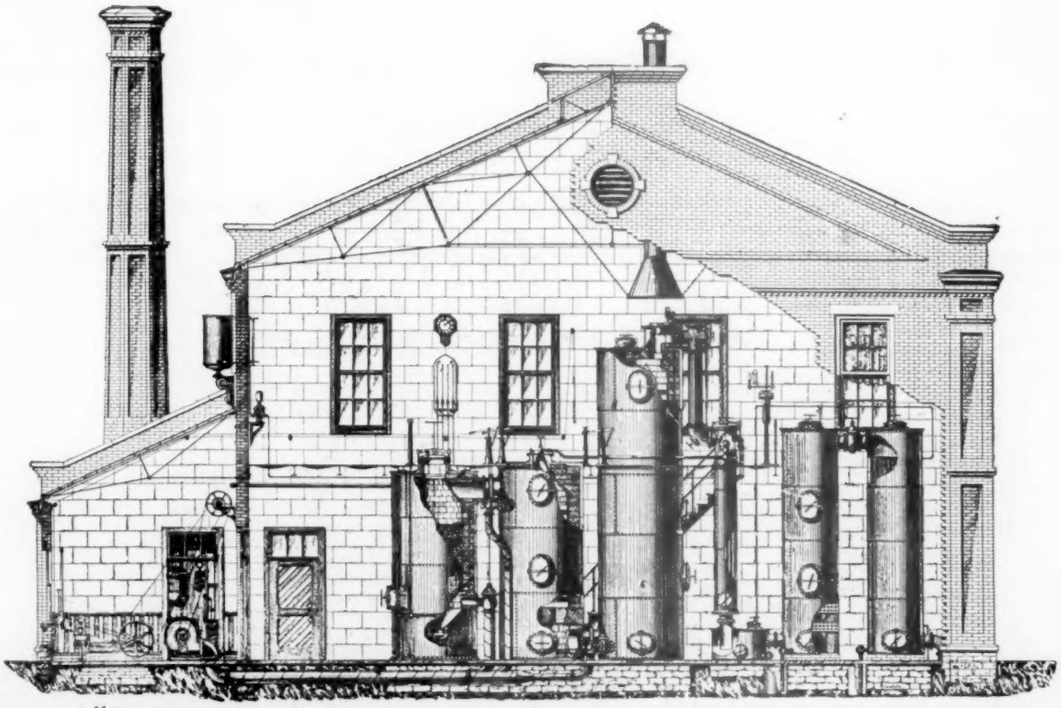
S. S. TOWNSEND, Gen. Agt., COOKE & CO., Selling Agts., 163 & 165 Washington St., N. Y.

THE UNITED GAS IMPROVEMENT CO.,

DREXEL BUILDING, PHILA., PA.

Owners of the Lowe, Granger-Collins, McKay-Critchlow (for carbureting Natural Gas), and Other Gas Patents.

BUILDERS, LESSEES and PURCHASERS OF GAS WORKS.



Standard "Double Superheater" Lowe Apparatus, Especially Designed for the Use of Lima Crude Oil.

Erectors of

WATER GAS PLANTS,

(Either Independent or Auxiliary to Coal Gas Works),

USING LIMA OR OTHER LOW GRADE OILS AND ANTHRACITE COAL OR GAS HOUSE OR OVEN COKE.

PAMPHLETS, PLANS, AND ESTIMATES FURNISHED UPON APPLICATION.

NATIONAL GAS LIGHT AND FUEL CO.,

218 La Salle Street, Chicago.

C. D. HAUK, Prest. & Gen'l Manager. A. W. GREEN, Vice-Prest. N. A. McCLARY, Sec. & Treas. E. E. MORRELL, Engr.

GAS WORKS

Built, Remodeled, Leased, and Purchased.

71 Springer Cupolas have been installed in the U. S. during the past four years.

The total capacity of Springer Apparatus now in use is over 25,000,000 ft. daily.

THE SPRINGER CUPOLA SYSTEM

Has Proven Itself the most Economical and Satisfactory Method of Gas Manufacture ever brought to the attention of the Gas Fraternity.

GUARANTEED ESTIMATES of Cost of Gas Furnished on Application.

GASHOLDER TANK CONSTRUCTION, ETC.

Gas Companies and others about to erect Gasholders will find it profitable to consult W. C. Whyte, who for over 30 years has made a specialty of

Tank Excavation and Mason Work.

Fifty Tanks now in operation show the sort of work done. Address

W. C. WHYTE, - No. 15 Cortlandt Street, N. Y. City.

WHAT OUR CUSTOMERS SAY OF IRON SPONGE.

COLUMBUS, O. I regard the Connelly Iron Sponge as the best form of oxide of iron of which I have any knowledge.
E. McMILLIN, Eng'r.

OHIO PENITENTIARY, I take pleasure in saying that the Iron Sponge bought of you two years ago, and which has been in constant use ever since, has given entire satisfaction. It does all you claim for it; in fact it reduces the cost of purifying to almost nothing—which certainly ought to be satisfactory. R. P. GREEN, Supt.

CINCINNATI, O. Our experience shows that by the use of Iron Sponge in place of lime we have effected a saving of 1.4 cents per M. in cost of purification. A. HICKENLOOPER, Prest.

SANDUSKY, O. The Iron Sponge has been a great advantage and saving to us over old method. THOS WOOD, Supt.

CADIZ, O. We have been using your Sponge for five years with entire satisfaction, and at about one-fourth the cost when we used lime for purification. A. N. HAMMOND, Supt.

LOGAN O. We have no desire to go back to purification by lime.
A. MICHIE, Sec.

LIMA, O. We have used your Iron Sponge for two years, nothing else, and are entirely satisfied with it. LIMA GAS LT. CO.

TROY, O. Recommend Iron Sponge to any Gas Company. It is as good and far cheaper than lime, and far less labor connected with it. R. A. DITTMAR, Supt.

WOOSTER, O. We have used your Iron Sponge about 8 months with entire satisfaction, and we shall continue to use it as long as we can do so with the success we have had thus far.
WOOSTER GAS LT. CO.

HAMILTON, O. We have been using your Iron Sponge for the past 5 years exclusively—using no lime with it—and it affords us pleasure to testify to its merits. Our present lot has been in use now over 16 months. D. H. HENSLEY, Sec.

MANSFIELD, O. Our Company has been using your Iron Sponge for 2 years in our works for purifying. It has been very satisfactory, and we would not know how to get along without its use.
G. S. HARRIS, Supt.

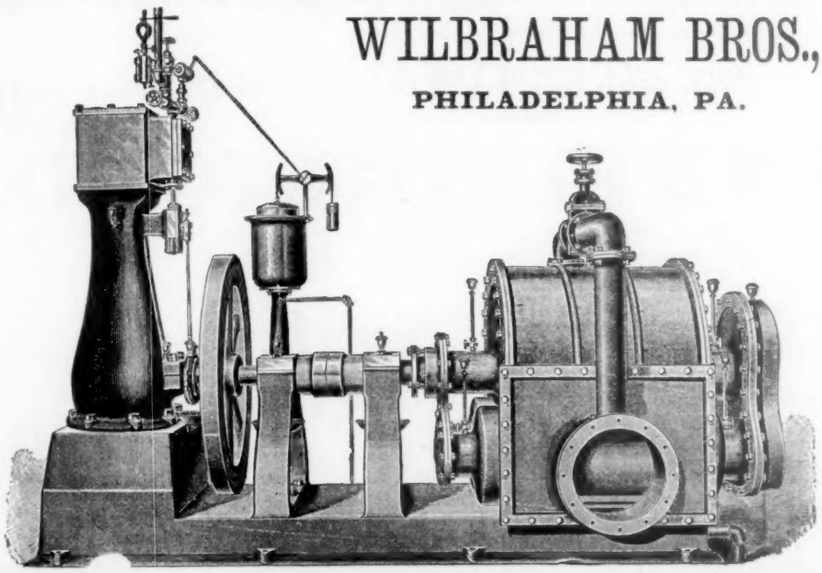
PORTSMOUTH, O. We have been using your Iron Sponge, and so far *it has given entire satisfaction.* J. W. SMITH, Sec.

PAINESVILLE, O. We have used your Iron Sponge for the past 2 years, and shall continue to use it. *It gives perfect satisfaction.* J. W. ALEXANDER, Prest.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 111 Broadway, New York.

WILBRAHAM
GAS EXHAUSTER & ENGINE COMBINED.

WILBRAHAM BROS.,
PHILADELPHIA, PA.



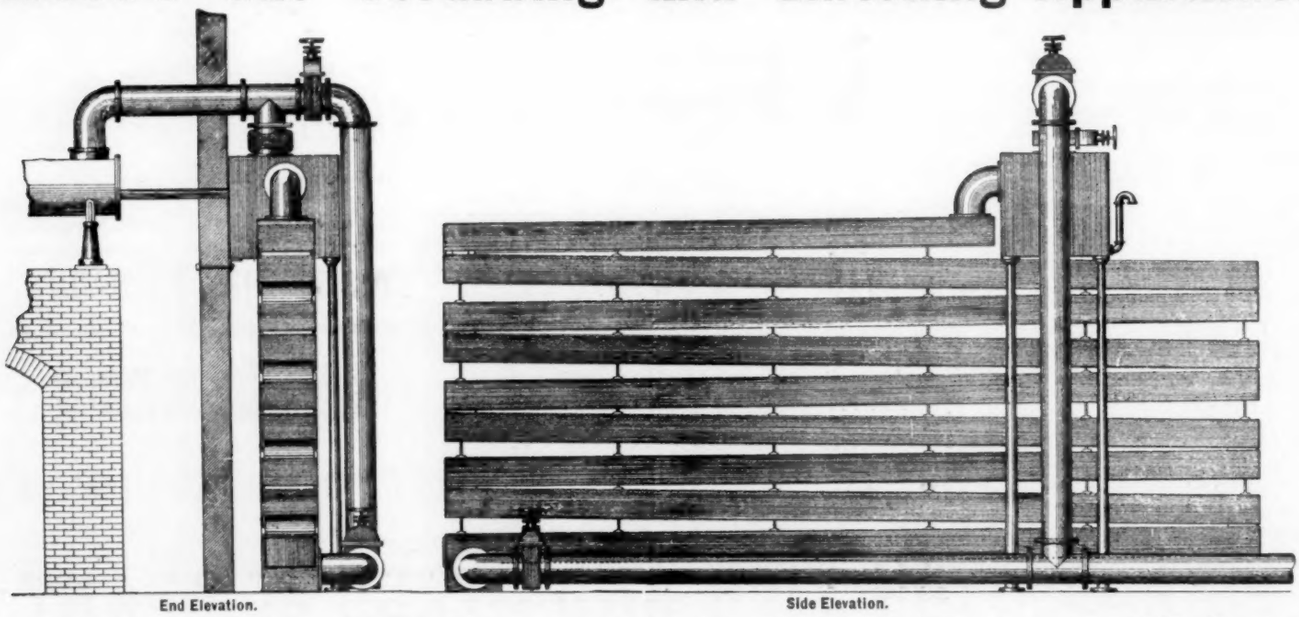
IRON MASS
For Gas Purification.
Acts immediately, and more efficiently than any other purifying agent now in use.
Greenpoint Chemical Works.
JOHN SCHRIEVER, Manager.
Greenpoint Ave. & Newtown Creek, Brooklyn N.Y.

JARVIS ENGINEERING CO.,
61 Oliver St., Boston, Mass.
CONTRACTORS FOR ERECTING
COMPLETE STEAM OUTFITS FOR ELECTRIC LIGHTING STATIONS.
Steel Boilers set with Jarvis Pat. Boiler Setting
To burn COKE SCREENINGS for Fuel.
ARMINGTON & SIMS CO. ENGINES,
Belting direct to Dynamos, without using Shafting.
SEND FOR CIRCULARS.
REFERENCES.—Charlestown Gas & Electric Light Co., Charlestown, Mass.; Schenectady Gas & Electric Light Co., Schenectady N. Y.; Brookline Gas Co., Brookline, Mass.

Gasholder Tanks & Gas Works Masonry Complete.
PLANS PREPARED AND ESTIMATES FURNISHED AT SHORT NOTICE.
J. P. WHITTIER, 70 Rush St., near Division Av., Brooklyn, N. Y.
A Large Quantity of Ground Fire Brick For Sale Cheap.

1890 DIRECTORY 1890
OF THE GAS LIGHT COMPANIES of the UNITED STATES & CANADA
Price, - - - - - - - $5.00.
A. M. CALLENDER & CO., No. 32 Pine Street, N. Y. City.

Wood's Gas Scrubbing and Enriching Apparatus.



End Elevation. Side Elevation.

The cheapest, simplest, and most effective apparatus for removing Tar and Ammonia, and enriching Gas, ever brought to the attention of Gas Manufacturers. With ordinary condensers and scrubbers the condensable illuminants flow off to the tar wells and liquor tanks and are lost, but with Wood's Apparatus these illuminants are saved and retained in the gas, thus increasing its illuminating power and making a great saving in the cost of enriching material. Where set up next after the Hydraulic main, this Scrubber produces an 8-oz. Ammoniacal Liquor.

JAMES R. FLOYD & SONS, - - Nos. 531 to 543 West 20th Street, N. Y. City.

FORT WAYNE ELECTRIC CO.

FORT WAYNE, IND.

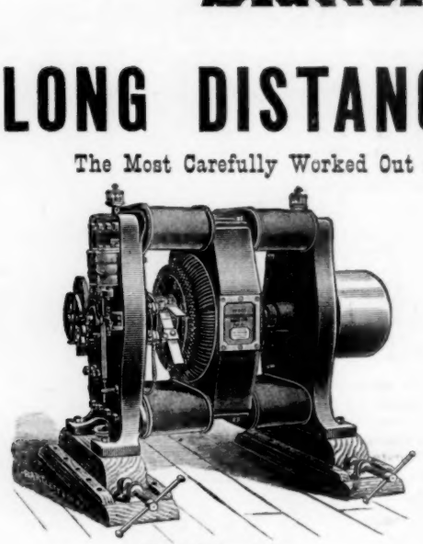
MANUFACTURERS OF THE

Slattery Induction System

—OF—

LONG DISTANCE INCANDESCENT LIGHTING.

The Most Carefully Worked Out and Complete Alternating Current System of Electric Lighting in Existence.



Wood Dynamo.

—AND THE—

WOOD

Automatically Regulating

ARC DYNAMOS AND LAMPS.

Main Office and Factory, Fort Wayne, Ind.

BRANCH OFFICES.

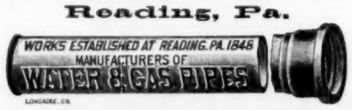
NEW YORK, - - - 115 Broadway.	PITTSBURCH, PA., - - 533 Wood Street.
PHILADELPHIA, - - - 907 Filbert Street.	DALLAS, TEXAS, - - - McLeod Building.
CHICACO, - - - - 185 Dearborn Street.	TORONTO, CANADA, - 138 King Street, West.
SAN FRANCISCO, - 35 New Montgomery Street.	MEXICO, F Adams' Successors, - City of Mexico.
BUFFALO, N. Y., - - - 228 Pearl Srteet.	CUBA, Maicas & CO., - - Havana.

ENGINEERS.

P. D. WANNER, Chairman. A. H. MELLERT, Mangr. of Wks.
R. B. KINSEY, Secretary. F. A. KNOPP, Treasurer.

MELLERT FOUNDRY & MACHINE CO. Ltd. and READING FOUNDRY CO., Ltd.

Reading, Pa.



Specials—Flange Pipe, Valves and Hydrants Lamp Posts, Retorts, etc.

General Foundry and Machine Work.

JOHN FOX, Selling Agent. **160 Broadway, N.Y.**

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

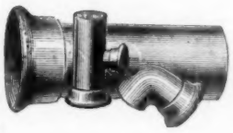
GENERAL FOUNDERS AND MACHINISTS.

Columbus, Ohio.

GAS AND WATER PIPES.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.



New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

M. J. DRUMMOND,

SPECIAL CASTINGS AND LAMP POSTS.

Office, Corbin Building, 192 Broadway, N. Y.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

THE ADDYSTON PIPE AND STEEL COMPANY.

CAST IRON

PIPE

CINCINNATI, OHIO.

FOR MANUFACTURED AND NATURAL GAS AND WATER.

SPECIALS, FLANGE PIPE, AND LAMP POSTS.

JAMES R. SMEDBERG,

Gas Engineer,

213 Jefferson Ave., Peoria, Ill.,

Will furnish Plans, Specifications and Estimates for the Remodeling or extension of Gas Works. Also, Analytic Reports upon the business condition and prospects of Gas Companies. Ample references will be given.

DURAND WOODMAN, Ph.D.,

Analytic and Technical

CHEMIST.

Analyses of Gas, Fuel and Gas Coals, Crude and Refined Petroleum, Materials for Gas Purification, Tar, Ammoniacal Liquors and other Bye-Products, Fire Clays, Deposits in Mains, Water for Steam Making, Boiler Scale, etc , etc. Expert work in connection with "Damages to adjacent water supplies and adjoining properties." Experimental Investigations for Inventors

127 Pearl Street (Hanover Square), N. Y.

JOS. R. THOMAS,

No. 32 Pine Street, N.Y. City.

CONSULTING AND CONSTRUCTING

Gas Engineer and Contractor.

PLANS, SPECIFICATIONS, AND ESTIMATES FURNISHED.

Contracts taken for all Appliances required at a Gas Works,

Either for New Works or Extensions to Old Plants.

WESTINGHOUSE ENGINES

THE DIFFERENCE!

The power of any Engine is regulated, 1st. By the Steam Pressure. 2d. By the Cylinder Area. 3d. By the Speed!

Owing to the SINGLE-ACTING principle of Westinghouse Engines, the standard speed of small ones is 500 and of large ones 250 revolutions per minute; while the speed of other Engines is limited to about 200 in small and 70 to 100 revolutions in large ones where durability is duly considered!

The ordinary Steam Engine requires constant attention, largely from two causes: 1st. Because its design (not admitting of self-lubrication) must have all parts lubricated by hand many times daily; 2d. Because the DOUBLE-ACTING principle MUST loosen the parts. This is only a question of time. If the Engine be well built, more time; if carelessly built, less time; the result, however, is inevitable. It is a question of principle and not of workmanship. Imagine the shock produced by reversing the full power at every stroke. Just think how this shock is aggravated when the Engine is speeded up! The blow is equal to that of a steam hammer, and MUST loosen the parts.

The low initial speed of the ordinary Engine necessitates "speeding-up," as it is called, in driving all machinery that runs even at ordinary speeds. This "speeding-up" process involves an outlay for shafting, hangers, pulleys, belting, etc., often equal to the cost of the Engine itself! It costs at least $5.00 per year to lubricate each additional bearing. It costs the fuel necessary to drive all this useless, expensive and non-productive machinery, bought and run for the sole purpose of obtaining requisite speeds.

WESTINGHOUSE ENGINES have been designed by intelligent and experinced Steam Engineers, expressly to meet and correct these manifest evils!

6000 in use!

Illustrated printed matter furnished on application.

THE WESTINGHOUSE MACHINE COMPANY.

PITTSBURGH. PENNA. U.S. OF A.

RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK.

J. H. GAUTIER & COMPANY
CORNER OF
GREENE AND ESSEX STREETS,
JERSEY CITY, N. J.
MANUFACTURERS OF
Clay Gas Retorts,
Gas House Tiles,
Fire Bricks, Etc. Etc.
Ground Clay, Fire Brick and Fire Sand in Barrels,
H. GAUTIER, Prest. CHAS. E. GAUTIER, Sec. & Treas.
CHAS. E GREGORY, V.-Prest. DAVID R. DALY, Gen'l Mang'r.

BROOKLYN
Clay Retort & Fire Brick Works,
(EDWARD D. WHITE & CO.)
Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.
VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.
Office, 88 Van Dyke St., Brooklyn, N. Y.

LACLEDE FIRE BRICK MFG. CO.,
MANUFACTURERS OF
Fire Brick, Gas Retorts,
AND
ST. LOUIS STANDARD SEWER PIPE.
Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.
OFFICE AND DEPOT
901, 903, and 905 Pine Street,
ST. LOUIS, MO.

ESTABLISHED IN 1845.
B. KREISCHER & SONS,
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
Gas Retorts,
TILES, FIRE BRICK.
AND EVERYTHING IN THE FIRE CLAY LINE.

MANHATTAN
FIRE BRICK & ENAMELLED CLAY
RETORT WORKS
ADAM WEBER.
CLAY GAS RETORTS
AND RETORT SETTINGS
FIRE BRICKS, TILES, ETC.,
Office and Works, 15th Street and Avenue C., N. Y

Works, LOCKPORT STATION, PA.
—ESTABLISHED 1864.—
JAMES GARDNER, JR.,
Successor to WILLIAM GARDNER & SON.
Office, Rooms 19 & 20, Lewis Block PITTSBURGH, PA. P. O. Box 373
Fire Clay Goods for Gas Works.
SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.
H. A. NORTON, No. 92 WATER STREET, BOSTON, MASS., Agent for the New England States.

GEO. C. HICKS, Prest. **CHICAGO** CHAS. A. REED, Sec. & Treas.
Retort and Fire Brick Co.,
MANUFACTURERS OF
Fire Clay Goods of all Kinds,
AND BEST QUALITY ONLY.
Regenerative Furnaces & Water Gas Goods.
45th St., Clark to La Salle, Chicago.

GEROULD'S IMPROVED RETORT CEMENT.
A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address
C. L. GEROULD & CO.,
5 & 7 Skillman St., Brooklyn, N. Y.
Western Agent, H. T. GEROULD, Mendota, Ill.

Parker-Russell Mining and Mfg. Co.,
CITY OFFICE,
Mermod-Jaccard Bldg., Rooms 307 & 308, Broadway & Locust St., St. Louis, Mo.
PROPRIETORS OF THE
OAKHILL GAS RETORT & FIRE BRICK W'KS
Our immense establishment is now employed almost entirely in the manufacture of
Materials for Gas Companies
We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We have the *exclusive Agency for the West* of the celebrated
Kloenne-Bredel Full Depth and Semi-Recuperator Benches,
And also furnish and build
Our Own Styles Semi-Recuperator Furnaces for the use of Coal or Coke as fuel.

THOS. SMITH, Prest. AUGUST LAMBLA, Vice-Prest. & Supt.
BALTIMORE
RETORT & FIRE BRICK CO.
MANUFACTORY AT
LOCUST POINT BALTIMORE, MD.
Clay Retorts, Blocks & Tiles
FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.
Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.
WALDO BROS., 88 WATER ST., BOSTON, MASS
Sole Agents the New England States.

Boston Fire Brick Works Manufacturers of **Gas Retorts and Settings**
Under the Personal Supervision of MR. GEO. C. HICKS late of Chicago.
Fire Clay Goods of all kinds. Akron Sewer Pipe, Lime, Cement, etc. Agts. for the Arc Gas Lamp & Governing Gas Burners.
Send for Circulars and Prices to
FISKE, COLEMAN & CO., Managers, No. 62 Congress Street, Boston, Mass.

FRED. BREDEL, C. E.,

Contractor for the Complete Erection and Equipment of Gas Works.

Sole Proprietor of the KLOENNE PATENTS for North America.

Gas Condensing and Purifying Machine.

Doing all the Work Between Exhauster & Oxide Purifier.

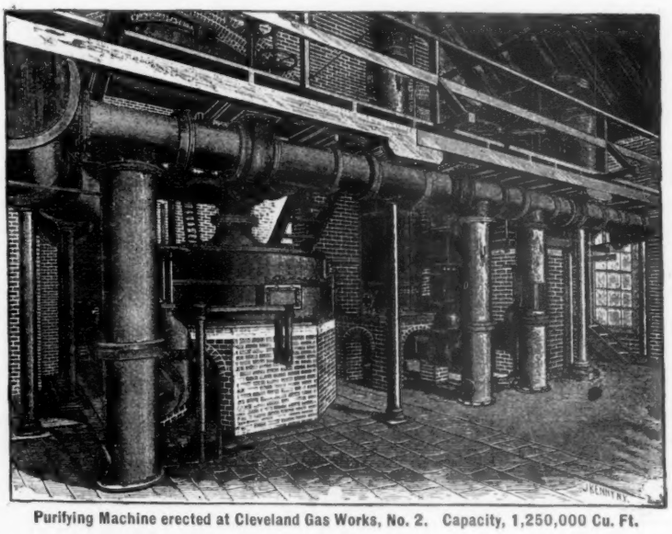
No Condensers Required.

No Naphthaline or Pitch is Formed.

HIGHER CANDLE POWER.

Tar & Ammonia Washers

WATER GAS WASHERS.



Purifying Machine erected at Cleveland Gas Works, No. 2. Capacity, 1,250,000 Cu. Ft.

RECUPERATIVE FURNACES.

Adapted to Retort Houses With or Without Stage Level.

Over 1,400 Retorts Now in Use in America.

Inclined Retort Benches.

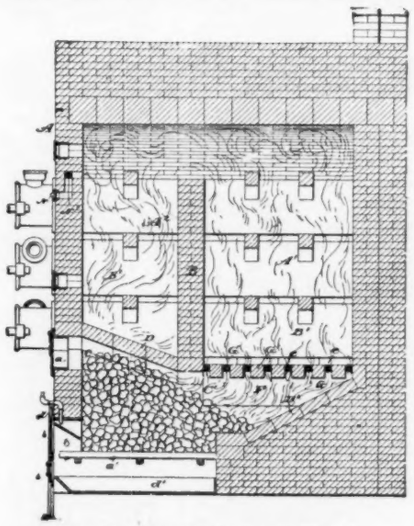
Refers, by permission, to Mr. Eugene Vanderpool, Newark, N. J., and Mr. E. G. Cowdery, Milwaukee, Wis.
For further information address

FRED. BREDEL,

118 Farwell Ave., Milwaukee, Wis. 22 Beaver St., N. Y. City.

FLEMMING'S

Generator-Gas Furnace



Materials furnished and Benches erected by

J. H. GAUTIER & CO., - Jersey City, N. J.

Address as above, or D. D. FLEMMING, Jersey City, N. J.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

THE NEW HANDY BINDER.

This article may be described as elegant in appearance, strong, durable, and possessing many special qualities of its own. It allows the opening of the pages perfectly flat, whether one or several numbers are in the binder. Any number can be taken out and replaced without disturbing the others. The papers are not mutilated for subsequent binding in permanent form. The binder is supplied with gilt side title, and is an ornament to any desk or reading table. The JOURNAL, filed in the Handy Binder, becomes a volume of great value, always convenient for instant reference. **Handy Binder, Postage paid. $1 00.**

A. M. CALLENDER & CO., 32 PINE STREET, NEW YORK CITY.

The American Gas Engineer and Superintendent's Handbook.

By WILLIAM MOONEY.

Consisting of Rules, Reference Tables, and Original Matter Pertaining to the Manufacture, Manipulation, and Distribution of Illuminating Gas.

350 Pages, Full Gilt Morocco. Price, $3.

A. M. CALLENDER & CO., 32 Pine St., N. Y.

NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS.

The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text, and much of it has been rewritten and otherwise improved. Price, cloth, $6.

A. M. CALLENDER & CO., 32 Pine St. N. Y.

DAVIS & FARNUM MFG. CO.,

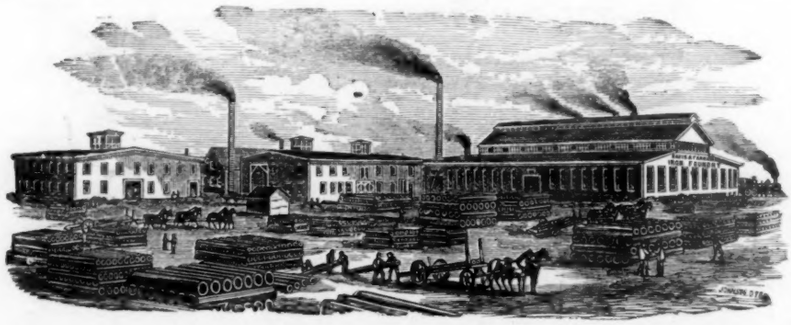
WALTHAM, MASS.

PRINCIPAL OFFICE AND WORKS, Waltham, Mass. BOSTON OFFICE, Room 13, Vulcan Building, 8 Oliver Street.

SINGLE, DOUBLE, AND TRIPLE LIFT

Gasholders.

OF ANY CAPACITY.



TUBULAR, PIPE, AND SINUOUS FRICTION

Condensers.

OF ALL SIZES.

IRON ROOF FRAMES AND FLOORS.

Purifying Boxes, Center Seal or Valve Connections, Bench Work.

Reversible Lime Trays.

SELF-SEALING AND PRESSED STEEL MOUTHPIECE LIDS.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Plant

— ALSO —

Gas and Water Pipe, Flanged Pipe,

Sugar House Work, and Special Castings of all Descriptions.

Established 1861. Incorporated 1881.

KERR MURRAY MFG. CO.

FORT WAYNE, IND.

Those who are in need of

Holders or Gas Works Apparatus of any Description,

AND OF THE LATEST IMPROVEMENTS,

will find it to their interest to

GET AN ESTIMATE FROM US

before placing their order.

As we make a Specialty of this Class of Work, and are Practical Builders and Manufacturers of same,

with our long years of experience in the business,

WE CAN GUARANTEE YOU SATISFACTION.

Estimates, Plans and Specifications Furnished on Application.

BARTLETT, HAYWARD & CO.

Baltimore, Md.

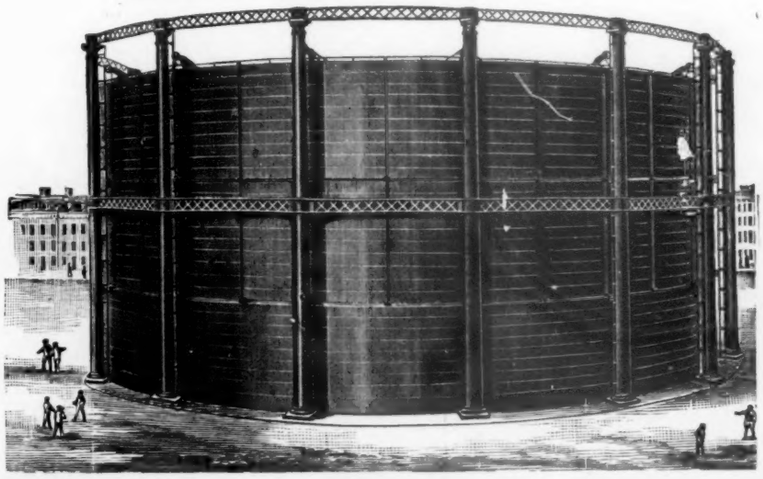
Triple Double, & Single-Lift
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Cirders.

BEAMS.



PURIFIERS.

CONDENSERS.

Scrubbers.

BENCH CASTINGS.

OIL STORAGE TANKS.

Boilers.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

Munich Regenerative Furnace, System Drs. Schilling & Bunte.

MILL'S REVERSIBEL LIME TRAYS.

Gas Works Designed and Constructed.

Pascal Iron Works. ESTABLISHED —1821.— Delaware Iron Works.

MORRIS, TASKER & CO.,

INCORPORATED.

OFFICE, 224 SOUTH THIRD STREET, - - PHILADELPHIA, PA.

CONTRACTORS, BUILDERS, AND MANUFACTURERS OF

Gas, Water & Sugar Works

Bench Castings.

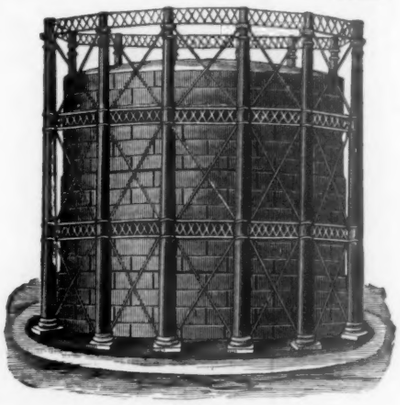
Condensers.

Scrubbers.

Purifiers.

Hyd. Carriages.

Iron Floors,



Iron Roofs.

Street Stops,

Valves, etc.

Stand-Pipes.

Water & Oil

Tanks, all Sizes.

Single, Double, and Triple-Lift Gas Holders.

SELF-SEALING RETORT LIDS. STAMPED STEEL RETORT LIDS.

Locomotive Water Columns, Filters, etc. Boiler Tubes, Wrought Iron Pipe & Fittings

Plans, Specifications and Estimates for all kinds of Machinery furnished on application.

Foundries & Works, MILLVILLE, FLORENCE, and CAMDEN, N. J.

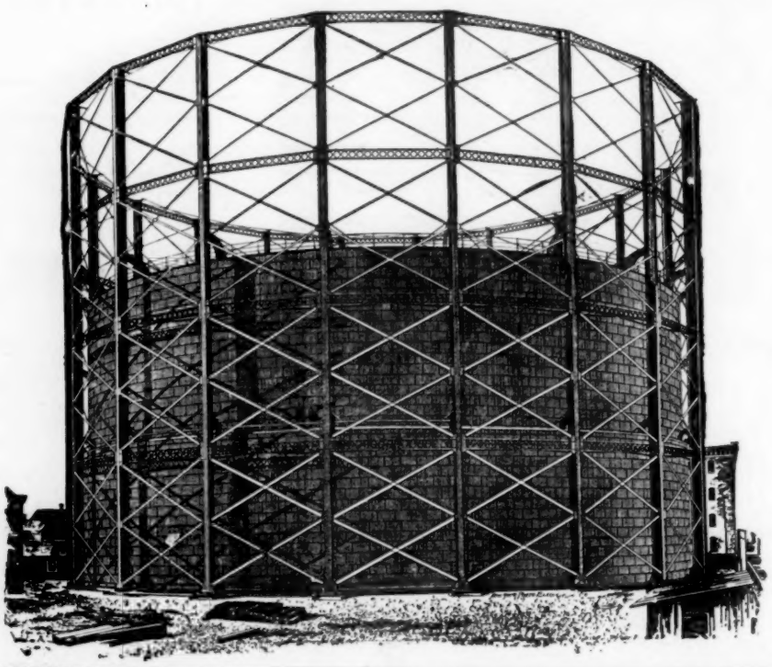
R. D. WOOD & CO.,

Engineers, Iron Founders, and Machinists.

400 Chestnut St., PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE,



Gas Holders,

SINGLE, DOUBLE, AND TRIPLE LIFTS, WITH OR WITHOUT WROUGHT IRON OR STEEL TANKS.

PURIFIERS, CONDENSERS.

Scrubbers.

BENCH WORK.

Iron Floors and Roofs, Plate Girders.

Heavy Loam Castings.

HYDRAULIC WORK.

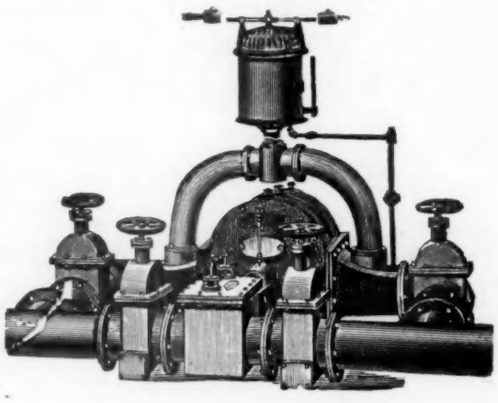
Lamp Posts, Valves, Etc.

ISBELL-PORTER COMPANY,

(Successors to SMITH & SAYRE MFG. COMPANY)

G. G. PORTER, Prest. *245 Broadway, N. Y.* CHAS. W. ISBELL, Sec'y.

Machinery & Apparatus for Gas Works



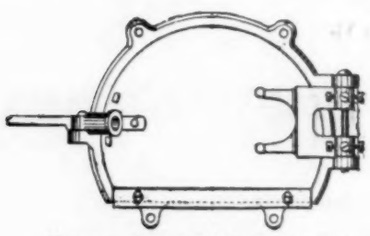
Drawings, Plans, and Estimates Furnished for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.

Mackenzie's Patent Rotary and Steam Jet Gas Exhausters, Governors, Compensators, Condensers, Washers, Scrubbers. Isbell's Patent Automatic Street Pressure Governor, Gas and Water Valves, Hydraulic Main Dip Regulator, Bench Castings, etc. Purifying Boxes and "Standard" Scrubbers Isbell's Patent Self-Sealing Retort Doors

THE BRENNER SELF-SEALING RETORT DOOR.

Simple, Strong, and Durable.

CLOSES ABSOLUTELY TIGHT & IS LOCKED BY A CAM LEVER. ALL NECESSARY ADJUSTMENT FOR WEAR PROVIDED.



Brenner Self-Sealing Retort Door.

BUILT BY

ISBELL-PORTER COMPANY,

(Successors to Smith & Sayre Mfg. Co.)

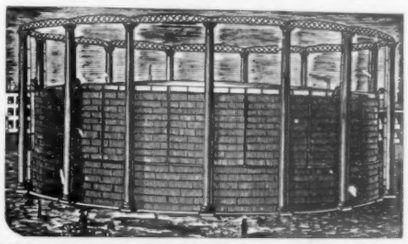
No. 245 Broadway, - - - - New York City.

WILLIAM B. LUNDIE, Superintendent of the 42d Street Station of the Consolidated Gas Company, of New York, writes, under date of Jan. 4, 1889:

"We have 320 Brenner Self-Sealing Lids in use at this Station, built by the Smith & Sayre Mfg. Co. They require very little attention, and are the best of the kind that I have seen, giving entire satisfaction."

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.

JAMES R. FLOYD & SONS,
(SUCCESSORS TO HERRING & FLOYD)
Oregon Iron Works,
W. 20th & 21st. Sts., bet. 10th & 11th Avs.,
NEW YORK CITY.
Engineers and Contractors
FOR THE
CONSTRUCTION OF GAS WORKS.
MANUFACTURERS OF
All Kinds of Castings and General Ironwork
FOR
GAS APPARATUS.
Bench Castings, Regenerative and Half Regenerative Furnace Castings.
Condensers, Scrubbers, Purifiers, Street Drips and Connections,
Valves,
Hydraulic Hoisting Purifier Carriage, Self-Sealing Retort Lids, Improved Valve Stand and Indicator, Seller's Cement.
Plans, Specifications, and Estimates furnished for Construction of New or Alteration of Old Works.

CONTINENTAL IRON WORKS.
THOS. F. ROWLAND, Prest. WARREN E. HILL and CHAS. H. CORBETT, V-Prests. THOS. F. ROWLAND, JR., Sec. & Treas.

P. O. Station G., BROOKLYN, N. Y.
ENGINEERS AND MANUFACTURERS OF
Gas Holders
CONDENSERS, SCRUBBERS, VALVES,
PURIFIERS, SELF-SEALING RETORT LIDS,
Hydraulic Mains,
And all other articles connected with the manufacture and distribution of Gas.

H. RANSHAW, Prest. & Mangr. WM. STACEY, Vice-Prest. T. H. BIRCH, Asst. Mangr. R. J. TARVIN, Sec. & Treas.
STACEY MFG. CO.,
MANUFACTURERS OF
Single and Telescopic Gasholders,
IRON ROOFS, BRIDGES, LAMP POSTS,
Water and Oil Tanks, Coal Elevator Cars,
COKE CRUSHERS, BENCH CASTINGS,
And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works. Rolling Mill Machinery and Heavy Castings a Specialty.
Foundry: 33, 35, 37 & 39 Mill Street. **Wrought Iron Works:** 16, 18, 20, 22, 24 & 26 Ramsey Street:
Cincinnati, Ohio.

Bouton Foundry Co.,
FOUNDERS AND MACHINISTS,
CHICAGO, ILL.
Gas Works Apparatus,
PURIFIERS, CONDENSERS,
Bench Work
SPECIALS, LAMP POSTS,
SCRUBBERS,
Iron Roofs and Floors.
Plans and Estimates furnished for new works or extensions of old works.

1842. **DEILY & FOWLER,** 1891.
Laurel Iron Works.
Address, No. 39 Laurel Street, Philadelphia, Pa.
BUILDERS OF
GASHOLDERS,
Single and Telescopic.
Holders Built 1885 to 1890, Inclusive:

Omaha, Neb.	Port Chester, N. Y.	Paducah, Ky.	Pac-ny, Pa. (two)	Central Gas Lt. Co., New York City (d)
Scranton, Pa. (2d)	New Rochelle, N. Y.	Norwich, Conn.	Mount Vernon, N. Y.	Tacoma, Wash.
Long Island City, N. Y.	Salem, N. J (3d)	Seattle, W. T.	Binghamton, N. Y.	Knoxville, Tenn.
Macon, Ga.	Omaha, Neb. (2d)	San Diego, Cal.	Concord, N. H.	Pottstown, Pa.
York, Pa.	Lynn, Mass. (2d)	Northern Gas Lt. Co., of New York. N. Y.	Dover, Del. (2d)	Victoria, B. C.
Chester, Pa.	Little Rock, Ark.		Calais, Me.	Vancouver, B. C.
Hazleton, Pa. (2d.)	Irvington, N. Y.	Westerly, R. I.	New London, Conn. (2d	Charlottesville, Va.
Staten Island, N. Y.	South Boston, Mass.	Willimantic, Conn	West Chester, N. Y.	So. Framingham, Mass.
Saugerties, N. Y.	Rye, N. Y. (2)	Montclair, N. J.	Bay Shore, L. I.	Woonsocket, R. I.
Clinton, Mass. (Lan. Mills)	Woodstock, Ont.	Attleboro, Mass.	Washington, D. C.	Simcoe, Can.
Chattanooga, Tenn.	Malden, Mass.	Santa Cruz, Cal.	Newport, R. I. (2d)	Pittsfield, Mass. (2d)
Galveston, Texas. (3d.)	Staten Island, N. Y (2d)	Erie, Pa. (2d)	Morristown, N. J.	Chattanooga, Tenn. (2d)
Fort Plain, N. Y.	Woodstock, Ont.	West Chester, Pa. (2d	Lebanon, Pa	
Brunswick, Ga.	Malden, Mass.	Lancaster, Pa. (3d	Oakland, Cal.	

WM. HENRY WHITE,
No. 32 Pine Street, - - - New York City.
ENGINEER AND CONTRACTOR FOR THE
ERECTION AND EXTENSION OF
GAS, WATER, AND ELECTRIC LIGHT WORKS.
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

GAS COALS. CANNEL COALS. GAS ENRICHERS.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 & 229 Produce Exchange, New York.

Cable Address, "PERKINS, NEW YORK." Post Office Box 3695, New York.

GENERAL SALES AGENTS FOR

The Youghiogheny River Coal Company's

OCEAN MINE YOUGHIOGHENY GAS COAL.

HON. W. L. SCOTT, Prest. M. H. TAYLOR, Vice-Prest.

This Colliery is located at **SCOTT HAVEN, PA.**, in the center of the Youghiogheny Gas Coal District, and produces the **ONLY RELIABLE YOUGHIOGHENY COAL** for gas purposes. (See Map on p. 87 of this JOURNAL, Feb. 16, '85.)

POINTS OF SHIPMENT,

Locust Point, BALTIMORE. Pier No. 62, PHILADELPHIA.

ST. GEORGE, STATEN ISLAND, N. Y. HARBOR.

Also, Shippers of the following well-known Cannels:

Breckenridge & Old Kentucky Boghead from Kentucky,

AND THE

JELLICO CANNEL, from TENNESSEE.

Within the past four years we have delivered these Cannels to over One Hundred and Fifty Gas Companies in Thirty-five different States, and to some of the largest Gas Companies in

GREAT BRITAIN, ON THE CONTINENT, AND SOUTH AMERICA.

Single carloads or more delivered at any required point in the United States and Canada. Cargo shipments from

NEW YORK, PHILADELPHIA, BALTIMORE, NORFOLK, AND NEWPORT NEWS.

Particulars as to prices, etc., furnished upon application to the above address.

JAMES & WILLIAM WOOD,

Gas and Cannel Coal Contractors,

No. 40 St. Enoch Sq., Glasgow. No. 2 Talbot Court, London.

Proprietors of the **BATHVILLE COLLIERIES** (which produce the celebrated **BOGHEAD CANNEL**), Shields, Shieldmuir, Drumpeller, and other Collieries. This Firm offer

STANDARD CANNELS,

Unequaled as Gas Enrichers.

Analyses, prices, and all further information furnished on application to

Agency for U. S., Room 70, Nos. 2 & 4 Stone St., N.Y. City.

Established 1860.

CAESAR BROS.,

MANUFACTURERS OF

ENAMELED

Gas, Water Meter, and Clock

DIALS.

ALSO,

Enameled Iron Plates in Colors, and the Patent Enameled Letters and Numbers.

We make a specialty of this class of work, and, with our long experience of over 30 years, can guarantee not only satisfaction and correctness, but extremely low quotations. ESTIMATES AND SAMPLES FURNISHED ON APPLICATION.

Office & Salesrooms, 11 Park Row, N. Y.

Factory, 153, 155, 157, 159 West Avenue, Hunters Point, L. I., N. Y.

COKE CRUSHERS. GAS COALS. GAS COALS.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, Clarksburg, Harrison Co., W. Va.
WHARVES, Locust Point, Baltimore, Md.
OFFICE, 44 South Street, Baltimore, Md

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS. { BANGS & HORTON, 60 Congress St., Boston.

COXE BROS. & CO.

Cross Creek, Sugar Loaf & Beaver Meadow Lehigh Coals.

General Office, 143 Liberty St., New York.

Boston, 70 Kilby Street; Phila., 420 Walnut Street; Chicago, "The Rookery"; Buffalo, Coal and Iron Exchange; Milwaukee, 91 Michigan Street.

E. B. ELY, Gen'l Agent.

The Standard Oil Company,

REFINERS OF

NAPTHA AND GASOLINES

ALSO MANUFACTURERS OF

A Special Grade of Naptha for Gas Companies

FOR ENRICHING COAL GAS.

Correspondence solicited.

No. 43 Euclid Avenue, Cleveland, Ohio

To Gas Companies.

We make to order CAP BURNERS to burn any amoun under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

248 N 8th Street, Phila. Pa

Electric Light Primer.

By CHARLES L. LEVEY.

A simple and comprehensive Digest of all the most important facts connected with the running of the Dynamo and Electric Lights, with Precautions for Safety, etc.

Price, 50 cents.

A. M. CALLENDER & CO., 32 Pine St., N.Y

THE PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened & Prepared for Gas Purposes.

Their Property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

209 SOUTH THIRD STREET, PHILA., PA.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

Chesapeake & Ohio Railway Coal Agency,

FOR THE SALE OF THE

Superior Kanawha Gas Coals, Cannelton Cannel,

Also, SPLINT AND STEAM COALS

From the Kanawha and New River Regions, on the line of the Chesapeake & Ohio R'way.

C. B. ORCUTT, General Agent, - - No. 1 Broadway (Room 217) New York City

FRANCIS H. JACKSON, Prest. EDMUND H. MCCULLOUGH, V.-Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Penn.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in runn ng, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time

Made in Sizes of 5 10. 15 20. and 25 Horse Power. All Engines Guaranteed for One Year.

JOHN J. GRIFFIN & CO.,

Nos. 1513, 1515, 1517 & 1519 Race Street, PHILADELPHIA.
52 Dey St., NEW YORK. 75 N. Clinton St., (FRED. R. PERSONS, Mangr.) CHICAGO.

MANUFACTURERS OF

METERS FOR MEASURING GAS

IN ANY VOLUME.

Provers, Gauges, Registers, Etc., Etc.

EXPERIMENTAL APPARATUS FOR QUANTITATIVE AND QUALITATIVE ANALYSIS.

Careful and Prompt Attention paid to Repairing of all kinds of Meters and Apparatus.

Estimates Cheerfully Furnished.

Dry Gas Meters.

With 40 years' experience and the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

No. 153 Franklin Street, Boston, Mass.,

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges, Pressure and Vacuum Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Patent Cluster Lanterns for Street Illumination.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

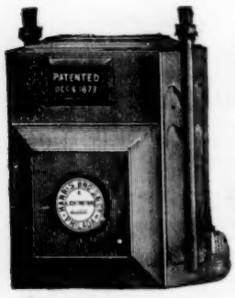
BALTIMORE, North & Saratoga Sts. **CHICAGO**, 122 & 124 Michigan St.
NEW YORK, 838 Broadway. **SAN FRANCISCO**, 221 Front St.
BOSTON, 92 Water Street, Rooms 21 and 22.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Success" and "Perfect" Gas Stoves.

A. HARRIS. E. L. HARRIS. J. A. HARRIS.

Established 1849.



HARRIS BROS. & CO.,

Twelfth and Brown Streets, Philadelphia.

Manufacturers of Wet and Dry Gas Meters,

STATION METERS, METER PROVERS,

EXPERIMENTAL METERS, SHOW OR GLAZED METERS,

Pressure and Vacuum Registers, Gauges, Photometers, Drip and Bell Pumps, Etc., Etc.

PROMPT ATTENTION GIVEN TO ALL ORDERS. METERS THOROUGHLY REPAIRED. ESTIMATES FURNISHED FOR STATION METERS OF ALL SIZES. CORRESPONDENCE SOLICITED.

GAS METERS. GAS METERS. GAS METERS.

GEO. J. McGOURKEY, Prest. WM. H. McFADDEN, Vice-Prest. (Phila.) WM. N. MILSTED, Gen. Supt. and Treas. (New York). WM. H. DOWN, Sec.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTER VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR & JET PHOTOMETERS.

Manufactories:
512 West 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES.
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
177 Elm Street, Cincinnati.
244 & 246 N. Wells Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter Street, San Francisco.

HELME & McILHENNY,

(Established 1848.)

GAS METER MANUFACTURERS,

Nos. 1339 to 1349 Cherry Street, Philadelphia, Pa.,

WET AND DRY GAS METERS. STATION METERS, EXPERIMENTAL METERS, METER PROVERS,

Center Seals, Pressure Registers, Governors, Indicators, Photometers, and all other kinds of Apparatus for use in Gas Works.

FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**

WM. WALLACE GOODWIN, President and Treasurer. E. STEIN, Vice-President. H. B. GOODWIN, Secretary and Superintendent.

THE GOODWIN GAS STOVE AND METER CO.,

Successors to W. W. GOODWIN & CO.

1012, 1014 & 1016 Filbert St., Phila., Pa. 113 Chambers St., N. Y. City. 44 & 46 Dearborn St., Chicago, Ills.

WALDO BROTHERS, Agents, 88 Water Streets, Boston, Mass.

MANUFACTURERS OF

DRY AND WET GAS METERS,

Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc. Meter Provers (sizes 2, 5, and 10 feet), Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6, and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Center Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete. Also, Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Manufacturers of the "SUN DIAL" GAS STOVES, for Cooking and Heating.

Goodwin's Improved Lowe's Jet Photometer. **Agents for Bray's Patent Gas Burners and Lanterns.**

Special attention to Repairs of Meters and all Apparatus connected with the business. All work guaranteed first-class in every particular. Orders filled promptly.

G. B. EDWARDS, Manager, New York. S. S. STRATTON, Manager, Chicago.

D. McDONALD & CO.,

GAS METER MANUFACTURERS.

(Established 1854.)

51 Lancaster St., Albany, N. Y. 34 & 36 West Monroe St., Chicago, Ill.

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS, PRESSURE GAUGES, ETC.

We use only the very best materials, and employ the most skilled labor, and by our long experience (37 years) and personal supervision of every detai we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the Ste Inspector's BADGE, and will be fully warrented by us. Our Annual and Calendar will be sent to Gas Companies upon application.

WM. WALLACE GOODWIN, President. E. STEIN, Vice-President. H. B. GOODWIN, Sec. & Supt. G. B. EDWARDS, Mang'r, New York. S. S. STRATTON, Mang'r, Chicago.

THE GOODWIN GAS STOVE AND METER CO.,

1012, 1014 & 1016 Filbert St., Phila., Pa. 113 Chambers St., N. Y. City. 44 & 46 Dearborn St., Chicago, Ills.

Agents, WALDO BROTHERS, 88 Water Street, Boston.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	36 in.
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	32 in.
	12 in. deep.	13 in. deep		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

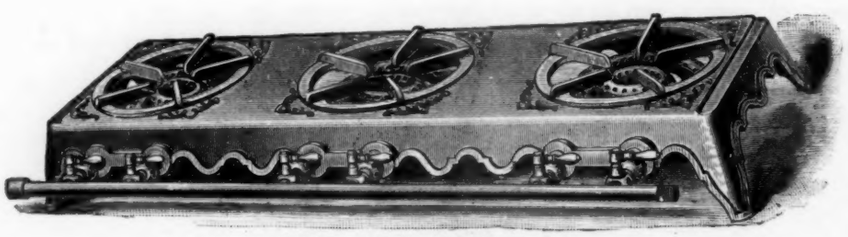
This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches ... consumption, 6 feet per hour at 1 in. pressure.



HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

... supply pipe should be used where the pressure is 1 in. or over.